# Final Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

Wyoming
EA Number: WY-21-01

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## Acronyms and Abbreviations

| | |
|---|---|
| ac | acre |
| a.i. | active ingredient |
| AChE | acetylcholinesterase |
| APHIS | Animal and Plant Health Inspection Service |
| ATV | All Terrain Vehicle |
| BIA | Bureau of Indian Affairs |
| BCF | bioconcentration factor |
| BLM | Bureau of Land Management |
| CEQ | Council of Environmental Quality |
| CFR | Code of Federal Regulations |
| EA | Environmental Assessment |
| e.g. | example given (Latin, exempli gratia, "for the sake of example") |
| EIS | Environmental Impact Statement |
| E.O. | Executive Order |
| ºF | degrees Fahrenheit |
| FAA | Federal Aviation Administration |
| FAASSTT | Field Aerial Application Spray Simulation Tower Technique |
| Fl. Oz. | fluid ounce |
| FONSI | finding of no significant impact |
| FR | Federal Register |
| FS | Forest Service |
| IMP | Interim Management Policy |
| HHERA | human health and ecological risk assessments |
| i.e. | in explanation (Latin, id est "in other words.") |
| IPM | integrated pest management |
| % | percent |
| lb | pound |
| lbs. | pounds |
| LWG | Local Working Group |
| MBTA | Migratory Bird Treaty Act |
| ml | milliliters |
| MOU | memorandum of understanding |
| MRAATs | Modified reduced agent area treatments |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NIH | National Institute of Health |
| ppm | parts per million |
| PPE | personal protective equipment |
| PPQ | Plant Protection and Quarantine |
| RAATs | reduced agent area treatments |
| SGCN | Species of Greatest Conservation Need |
| S&T | Science and Technology |
| UAS | Unmanned Aircraft Systems |
| ULV | ultra-low volume |
| U.S.C. | United States Code |

| | |
|---|---|
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USFS | United States Forest Service |
| USFWS | United States Fish and Wildlife Services |
| WGFD | Wyoming Game and Fish Department |
| WSA | Wilderness Study Area |

**Final Environmental Assessment**

**Rangeland Grasshopper and Mormon Cricket Suppression Program Wyoming**

# I. Need for Proposed Action

## *A. Purpose and Need Statement*

An infestation of grasshoppers or Mormon crickets may occur in Wyoming. The United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine (PPQ) and any cooperating agency, based on location of infestation may, upon request by land managers or state departments of agriculture, conduct treatments to suppress grasshopper and/or Mormon cricket infestations as part of the Rangeland Grasshopper and Mormon Cricket Suppression Program (Program). The term "grasshopper" used in this environmental assessment (EA) refers to both grasshoppers and Mormon crickets, unless differentiation is otherwise noted.

Populations of grasshoppers that trigger the need for a suppression program are normally considered on a case-by-case basis. Participation in grasshopper suppression programs is based on potential damage, such as reduced forage, and benefits of treatments which include reduction of pest outbreak populations and control of incipient pest populations. The goal of the proposed suppression program analyzed in this EA is to reduce grasshopper populations to economically acceptable levels in order to protect rangeland ecosystems or cropland adjacent to rangeland.

This EA analyzes potential effects of the proposed action and its alternatives. This EA applies to a proposed suppression program that would take place from March 1 to September 31, 2021 in Wyoming.

This EA is prepared in accordance with the requirements under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code § 4321 *et. seq.*) and the NEPA procedural requirements promulgated by the Council on Environmental Quality, USDA, and APHIS. A decision will be made by APHIS based on the analysis presented in this EA, the results of public involvement, and consultation with other agencies and individuals. A selection of one of the program alternatives will be made by APHIS for the 2021 Control Program for Wyoming.

## *B. Background Discussion*

Rangelands provide many goods and services, including food, fiber, recreational opportunities, and grazing land for cattle (Havstad et al., 2007; Follett and Reed, 2010). Grasshoppers and Mormon crickets are part of rangeland ecosystems, serving as food for wildlife and playing an important role in nutrient cycling. However, grasshoppers and Mormon crickets have the potential to occur at high population levels (Belovsky et al.,

1996) that result in competition with livestock and other herbivores for rangeland forage and can result in damage to rangeland plant species.

In rangeland ecosystem areas of the United States, grasshopper populations can build up to economic infestation levels[1] despite even the best land management and other efforts to prevent outbreaks. At such a time, a rapid and effective response may be requested and needed to reduce the destruction of rangeland vegetation. In some cases, a response is needed to prevent grasshopper migration to cropland adjacent to rangeland.

APHIS surveys grasshopper populations on rangeland in the Western United States, provides technical assistance on grasshopper management to land owners and managers, and may cooperatively suppress grasshoppers when direct intervention is requested by a Federal land management agency or a State agriculture department (on behalf of a State or local government, or a private group or individual). APHIS' enabling legislation provides, in relevant part, that 'on request of the administering agency or the agriculture department of an affected State, the Secretary, to protect rangeland, shall immediately treat Federal, State, or private lands that are infested with grasshoppers or Mormon crickets'… (7 U.S.C. § 7717(c)(1)). The need for rapid and effective response when an outbreak occurs limits the options available to APHIS. The application of an insecticide within all or part of the outbreak area is the response available to APHIS to rapidly suppress or reduce grasshopper populations and effectively protect rangeland.

In June 2002, APHIS completed an environmental impact statement (EIS) document concerning suppression of grasshopper populations in 17 western states (Rangeland Grasshopper and Mormon Cricket Suppression Program, Environmental Impact Statement, June 21, 2002). The EIS described the actions available to APHIS to reduce the damage caused by grasshopper populations in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming. During November 2019, APHIS published an updated EIS to incorporate the available data and analyze the environmental risk of new program tools. The risk analysis in the 2019 EIS is incorporated by reference.

APHIS will follow all state laws regarding pesticide application including Wyoming State Statutes §35-7-350 through §35-7-375 (http://legisweb.state.wy.us/lsoweb/wystatutes.aspx) and Chapter 28 Rules and Regulations, State of Wyoming, (http://soswy.state.wy.us/Rules/default.aspx).

[1] The "economic infestation level" is a measurement of the economic losses caused by a particular population level of grasshoppers to the infested rangeland. This value is determined on a case-by-case basis with knowledge of many factors including, but not limited to, the following: economic use of available forage or crops; grasshopper species, age, and density present; rangeland productivity and composition; accessibility and cost of alternative forage; and weather patterns. In decision making, the level of economic infestation is balanced against the cost of treating to determine an "economic threshold" below which there would not be an overall benefit for the treatment. Short-term economic benefits accrue during the years of treatments, but additional long-term benefit may accrue and be considered in deciding the total value gained by treatment. Additional losses to rangeland habitat and cultural and personal values (e.g., aesthetics and cultural resources), although a part of decision making, are not part of the economic values in determining the necessity of treatment.

In October 2015, APHIS and the Bureau of Land Management (BLM) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on BLM lands (Document #15-8100-0870-MU, October 15, 2015). This MOU clarifies that APHIS will prepare and issue to the public environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BLM.

The MOU further states that the responsible BLM official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on BLM land is necessary. The BLM must also prepare a Pesticide Use Proposal (Form FS-2100-2) for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document and BLM prepares and approves the Pesticide Use Proposal.

In September 2016, APHIS and the Bureau of Indian Affairs (BIA) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on BIA lands (Document #10-8100-0941-MU, September 16, 2016). This MOU clarifies that APHIS will prepare and issue to the public environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BIA.

The MOU further states that the responsible BIA official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on BIA land is necessary. The request should include the dates and locations of all tribal ceremonies and cultural events, as well as "not to be treated" areas that will be in or near the proposed treatment block(s). According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document.

In November 2019, APHIS and the United States Forest Service (USFS) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on National Forest system lands (Document #19-8100-0573-MU, November 6, 2019). This MOU clarifies that APHIS will prepare and issue to the public environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the USFS.

The MOU further states that the responsible USFS official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on national forest land is necessary. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document.

### *C. About This Process*

The NEPA process for grasshopper management is complicated by the fact that there is very little time between requests for treatment and the need for APHIS to act swiftly with respect to those requests. Surveys help to determine general areas, among the millions of acres where harmful grasshopper infestations may occur in the spring of the following year. Survey data provides the best estimate of future grasshopper populations, while short-term climate or environmental factors change where the specific treatments will be needed. Therefore, examining specific treatment areas for environmental risk analysis under NEPA is typically not possible. At the same time, the program strives to alert the public in a timely manner to its more concrete treatment plans and avoid or minimize harm to the environment in implementing those plans.

The current EIS provides a solid analytical and regulatory foundation; however, it may not be enough to satisfy NEPA completely for actual treatment proposals, and the "conventional" EA process will seldom, if ever, meet the program's timeframe of need. Thus, a two-stage NEPA process has been designed to accommodate such situations. For the first stage, this EA will analyze aspects of environmental quality that could be affected by grasshopper treatment in Wyoming. This EA and finding of no significant impact (FONSI) will be made available to the public for a 30-day comment period. If comments are received during the comment period, they will be addressed in stage 2 of the process. For stage 2, when the program receives a treatment request and determines that treatment is necessary, the specific site within Wyoming will be extensively examined to determine if environmental issues exist that were not covered in this EA. This stage is intended mainly to ensure that significant impacts in the specific treatment area will not be experienced. A supplemental determination will be prepared to document this finding and would also address any comments received on this EA. Supplemental determinations prepared for specific treatment sites will be provided to all parties who comment on this EA.

## II. Alternatives

To engage in comprehensive NEPA risk analysis APHIS must frame potential agency decisions into distinct alternative actions. These program alternatives are then evaluated to determine the significance of environmental effects. The 2002 EIS presented three alternatives: (A) No Suppression; (B) Insecticide Applications at Conventional Rates and Complete Area Coverage; and (C) Reduced Agent Area Treatments (RAATs), and their potential impacts were described and analyzed in detail. The 2019 EIS was tiered to and updated the 2002 EIS. The 2019 EIS provides updates to the program with new information and technologies that were not analyzed in the 2002 EIS. Copies of the complete 2002 and 2019 EIS documents are available for review at USDA APHIS PPQ, 5353 Yellowstone Road, Suite 208, Cheyenne, Wyoming. These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program web site, http://www.aphis.usda.gov/plant-health/grasshopper.

The 2019 EIS is intended to explore and explain potential environmental effects associated with grasshopper suppression programs that could occur in 17 western states (Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming). The 2019 EIS outlines the importance of grasshoppers as a natural part of the rangeland ecosystem. However, grasshopper outbreaks can compete with livestock and wildlife for rangeland forage and cause devastating damage to crops and rangeland ecosystems. Rather than opting for a specific proposed action from the alternatives presented, the 2019 EIS analyzes in detail the environmental impacts associated with each programmatic action alternative related to grasshopper suppression based on new information and technologies.

All insecticides used by APHIS for grasshopper suppression are used in accordance with applicable product label instructions and restrictions. Representative product specimen labels can be accessed at the Crop Data Management Systems, Incorporated web site at www.cdms.net/manuf/manuf.asp. Labels for actual products used in suppression programs will vary, depending on supplier. All insecticide treatments conducted by APHIS will be implemented in accordance with APHIS' treatment guidelines and operational procedures, included as Appendix 1 to this final EA.

This Final EA analyzes the significance of environmental effects that could result from the alternatives described below. These alternatives differ from those described in the 2019 EIS because grasshopper treatments are not likely to occur in most of Wyoming and therefore the environmental baseline should describe a no suppression scenario.

### *A. No Suppression Program Alternative*

Under Alternative A, the No Suppression alternative, APHIS would not fund or participate in a program to suppress grasshopper infestations within Wyoming. Under this alternative, APHIS may opt to provide limited technical assistance, but any suppression program would be implemented by a Federal land management agency, a State agriculture department, a local government, or a private group or individual.

### *B. Insecticide Applications at Conventional Rates or Reduced Agent Area Treatments with Adaptive Management Strategy (Preferred Alternative)*

Under Alternative B, the preferred alternative, APHIS would manage a grasshopper treatment program using techniques and tools discussed hereafter to suppress grasshopper outbreaks. The insecticides available for use by APHIS include the U.S. Environmental Protection Agency (USEPA) registered chemicals carbaryl, diflubenzuron, malathion, and chlorantraniliprole. Chlorantraniliprole is analyzed and discussed in the 2019 EIS, however this chemical will not be used for APHIS grasshopper suppression in Wyoming in 2021. The current label for chlorantraniliprole does not allow for ULV aerial application and would not be economically feasible for use in grasshopper suppression programs in Wyoming. Chlorantraniliprole will not be further analyzed or discussed in this document.

These chemicals have varied modes of action: carbaryl and malathion work by inhibiting acetylcholinesterase (AChE) (enzymes involved in nerve impulses); and diflubenzuron is a chitin inhibitor. APHIS would make a single application per year to a treatment area and could apply insecticide at an APHIS rate conventionally used for grasshopper suppression treatments, or more typically as reduced agent and area treatments (RAATs). APHIS selects which insecticides and rates are appropriate for suppression of a grasshopper outbreak based on several biological, logistical, environmental, and economical criteria. The identification of grasshopper species and their life stage largely determines the choice of insecticides used among those available to the program. RAATs are the most common and preferred application method for all program insecticides, and only rarely do rangeland pest conditions warrant full coverage and higher rates.

Typically, the decision to use diflubenzuron, the pesticide most commonly used by the program, is determined by the life stage of the dominant species within the outbreak population. Diflubenzuron can produce 90 to 97% grasshopper mortality in nascent populations with a greater percentage of early instars. If the window for the use of diflubenzuron closes, as a result of treatment delays, then carbaryl or rarely malathion are the remaining control options. Certain species are more susceptible to carbaryl bait, and sometimes that pesticide is the best control option.

The RAATs strategy is effective for grasshopper suppression because the insecticide controls grasshoppers within treated swaths while conserving grasshopper predators and parasites in swaths not directly treated. RAATs can decrease the rate of insecticide applied by either using lower insecticide concentrations or decreasing the deposition of insecticide applied by alternating one or more treatment swaths. Both options are most often incorporated simultaneously into RAATs. Either carbaryl, diflubenzuron, or malathion would be considered under this alternative, typically at the following application rates:

- 8.0 fluid ounces (fl. oz.) (0.25 pounds active ingredient (lbs. a.i.)) of carbaryl ultra-low volume (ULV) spray per acre;
- 10.0 pounds (lbs.) (0.20 lbs. a.i.) of 2% carbaryl bait per acre;
- 0.75 or 1.0 fl. oz. (0.012 lbs. a.i.) of diflubenzuron per acre;
- 4.0 fl. oz. (0.31 lbs. a.i.) of malathion per acre.

The width of the area not directly treated (the untreated swath) under the RAATs approach is not standardized. The proportion of land treated in a RAATs approach is a complex function of the rate of grasshopper movement, which is a function of developmental stage, population density, and weather (Narisu et al., 1999, 2000), as well as the properties of the insecticide (insecticides with longer residuals allow wider spacing between treated swaths). Foster et al. (2000) left 20 to 50% of their study plots untreated, while Lockwood et al. (2000) left 20 to 67% of their treatment areas untreated. Currently the grasshopper program typically leaves 50% of a spray block untreated for ground applications where the swath width is between 20 and 45 feet. For aerial applications, the skipped swath width is typically no more than 20 feet for malathion, 100 feet for carbaryl and 200 feet for diflubenzuron. The selection of insecticide and the use of an associated swath widths is site dependent. Rather than suppress grasshopper populations to the greatest extent possible, the goal of this method is to suppress grasshopper populations to less than the economic infestation level.

Contractors use of Trimble GPS Navigation or equivalent system equipment is used to navigate and capture shapefiles of the treatment areas. All sensitive sites are buffered out of the treatment area using flagging which is highly visible to the applicator. All sensitive sites are reviewed in the daily briefing with APHIS personnel including the applicator working on the treatment site.

Treatments are considered in areas of high populations of predominately pest grasshopper species. Typical treatment programs in Wyoming have historically used 1.0 fl. oz. of Diflubenzuron per acre with 50% coverage. Dependent on the size of the treatment and the aircraft capabilities, previous treatments had spacing of 150 foot swath widths alternating between treated and untreated swaths. If determined that treatment with 60% coverage and 40% skip is necessary, swath width is typically 150 foot treated swath and 100 foot untreated swath, again dependent on size of treatment and aircraft capabilities.

Insecticide applications at conventional rates and complete area coverage, is an approach that APHIS has used in the past but is currently uncommon. Under this option, carbaryl, diflubenzuron, or malathion would cover all treatable sites within the designated treatment block per label directions. The application rates under this option are typically at the following application rates:

- 16.0 fl. oz. (0.50 lbs. a.i.) of carbaryl spray per acre;
- 10.0 lbs. (0.50 lbs. a.i.) of 5% carbaryl bait per acre;
- 1.0 fl. oz. (0.016 lbs. a.i.) of diflubenzuron per acre;
- 8.0 fl. oz. (0.62 lbs. a.i.) of malathion per acre.

The potential generalized environmental effects of the application of carbaryl, diflubenzuron, and malathion under this alternative are discussed in detail in the 2019 EIS. A description of anticipated site specific impacts from this alternative may be found in Part IV of this document.

## *C. Research Treatments Alternative*

APHIS PPQ continues to refine its methods of grasshopper and Mormon cricket management in order to improve the abilities of the Rangeland Grasshopper and Mormon Cricket Suppression Program (herein referred to as the Program) to make it more economically feasible, and environmentally acceptable. These refinements can include reduced rates of currently used pesticides, improved formulations, development of more target-specific baits, development of biological pesticide suppression alternatives, and improvements to aerial (e.g., incorporating the use of Unmanned Aircraft Systems (UAS)) and ground application equipment. A division of APHIS PPQ, Science and Technology's (S&T) Phoenix Lab is located in Arizona and its Rangeland Grasshopper and Mormon Cricket Management Team (Rangeland Unit) conducts methods development and evaluations on behalf of the Program. The Rangeland Unit's primary mission is to comply with Section 7717 of the Plant Protection Act and protect the health of rangelands (wildlife habitats and where domestic livestock graze) against economically damaging cyclical outbreaks of grasshoppers and Mormon crickets. The Rangeland Unit tests and develops more effective, economical, and less environmentally harmful management methods for the Program and its federal, state, tribal, and private stakeholders.

To achieve this mission, research plots ranging in area from less than one foot to 640 acres are used and often replicated. The primary purpose of this research is to test and develop improved methods of management for grasshoppers and Mormon crickets. This often includes testing and refining pesticide and biopesticide formulations that may be incorporated into the Program. These investigations often occur in the summer (May-August) and the locations typically vary annually. The plots often include "no treatment" (or control) areas that are monitored to compare with treated areas. Some of these plots may be monitored for additional years to gather information on the effects of utilized pesticides on non-target arthropods. Note that an Experimental Use Permit is not needed when testing non-labeled experimental pesticides if the use is limited to laboratory or greenhouse tests, or limited replicated field trials involving 10 acres or less per pest for terrestrial tests.

Studies and research plots are typically located on large acreages of rangelands and the Rangeland Unit often works on private land with the permission of landowners. Locations of research trials will be made available to the appropriate agencies in order to ensure these activities are not conducted near sensitive species or habitats. Due to the small size of the research plots, no adverse effects to the environment, including protected species and their critical habitats, are expected, and great care is taken to avoid sensitive areas of concern prior to initiating studies.

### 1. Methods Development Studies

Methods development studies may use planes and all-terrain vehicles (ATVs) to apply labeled pesticides using conventional applications and the RAATs methodology. This research may include the use of an ULV sprayer system for applying biopesticides (such as native fungal pathogens). Mixtures of native pathogens and low doses of pesticides may be conducted to determine if these multiple stressor combinations enhance mortality. Aircraft will be operated by Federal Aviation Administration licensed pilots with an aerial pesticide applicator's permit.

The Rangeland Unit often uses one square foot micro plots covered by various types of cages depending on the study type and species used. These types of study plots are preferred for Mormon cricket treatments and those involving non-labeled research pesticides or biopesticides. The most common application method for micro plots is simulating aerial applications via the Field Aerial Application Spray Simulation Tower Technique (FAASSTT). This system consists of a large tube enclosed on all sides except for the bottom, so micro plot treatments can be accurately applied to only the intended treatment target. Treatments are applied with the FAASSTT in micro doses via a syringe and airbrush apparatus mounted in the top.

The Rangeland Unit is also investigating the potential use of Unmanned Aerial Systems (UAS) for a number of purposes related to grasshopper and Mormon cricket detection and treatment. UAS will be operated by Federal Aviation Administration (FAA) licensed pilots with an aerial pesticide applicator's permit.

### 2. Pesticides and Biopesticides Used in Studies

Pesticides likely to be involved in studies currently include those approved for Program use:

1) Liquids: diflubenzuron (e.g., Dimilin 2L and generics: currently Unforgiven and Cavalier 2L) and carbaryl (e.g., Sevin XLR-PLUS). Program standard application rates are: diflubenzuron - 1 fl. oz./acre in a total volume of 31 fl. oz./acre; carbaryl – 16 fl. oz/acre in a total volume of 32 fl. oz./acre. Research rates often vary, but the doses are lower than standard Program rates unless otherwise noted.

2) Baits: carbaryl. Program standard application rates: 2% bait at 10 lbs./acre (2 lbs. AI/acre) or 5% bait at 4 lbs./acre (2 lbs. AI/acre).

3) LinOilEx (Formulation 103), a proprietary combination of easily available natural oils and some commonly encountered household products, created by Manfred Hartbauer, University of Graz, Austria. Note that LinOilEx (Formulation 103) is experimental; for more information, see "Potential Impacts of LinOilEx Applications" in the section "Information on Experimental Treatments."

Biopesticides likely to be involved in studies currently include:

1) Metarhizium robertsii (isolate DWR2009), a native fungal pathogen. Note that Metarhizium robertsii (isolate DWR2009) is experimental; for more information, see "Potential Impacts of Metarhizium robertsii Applications" in the section "Information on Experimental Treatments."

2) Beauveria bassiana GHA, a native fungal pathogen sold commercially and registered for use across the U.S.

At this time, we are unsure where in the 17 states we will be doing most of the following proposed research field studies. The final location decision is dependent upon grasshopper and/or Mormon cricket population densities, and availability of suitable sites.

**Possible Study 1:** Building on research undertaken in 2020, we plan to further evaluate the efficacy of aerial treatments of Program insecticides using UAS. This study plans to use replicated 10 acre plots. Mortality will be then be observed for a duration of time to determine efficacy. Possible variants of this study (all of which will adhere to FAA regulations) may include night flights and treating with multiple UAS simultaneously (swarming).

**Possible Study 2:** Evaluate persistence of the experimental biopesticide DWR2009 in bait form by coating wheat bran with the pathogen. A species of local abundance will be placed into replicated microplot cages and fed the baits by hand. Mortality and sporulation will be then be observed for a duration of time to determine persistence in both the field and lab.

**Possible Study 3:** Evaluate efficacy of the experimental biopesticide DWR2009 in bait form by coating wheat bran with the pathogen. A species of local abundance will be placed into replicated microplot cages and fed the baits by hand. Mortality and sporulation will be then be observed for a duration of time to determine efficacy in both the field and lab.

**Possible Study 4:** A stressor study to evaluate efficacy of the experimental biopesticide DWR2009 in liquid form when combined with Dimilin 2L. The FAASSTT will be utilized to apply varying dose levels of Dimilin 2L (below label rates) in order to compare efficacy, starting at the rate of 1.0 fl. oz./acre. Replicated microplots will be treated and then a species of local abundance will be placed into each cage. Mortality will be then be observed for a duration of time to determine efficacy.

**Possible Study 5:** Evaluate efficacy of the experimental biopesticide DWR2009 in liquid and bait form (by coating wheat bran with the pathogen) using ultra-ultra low volume RAATs (involves a timing device and ULV nozzles) and a 10 acre plot. ATV-mounted liquid and bait spreaders will be utilized to apply DWR2009. Specimens will be periodically collected to observe mortality and sporulation for a duration of time to determine efficacy.

**Possible Study 6:** Evaluate efficacy of the experimental, non-traditional pesticide LinOilEx (Formulation 103). A micro-FAASSTT (airbrush system mounted on a 5 gal bucket) will be utilized to apply varying dose levels in order to compare efficacy, starting at the base rate of 6.64 ml/cage. A species of local abundance will be placed into replicated microplot cages and sprayed directly. Mortality will be then be observed for a duration of time to determine efficacy.

# III. Affected Environment

## *A. Description of Affected Environment*

This EA covers the State of Wyoming. Additionally, APHIS recognizes that concerns outside this area could necessitate protection buffers that extend into this area.

The size of this region is approximately 97,914 square miles (62,664,960 acres). The total relief is 10,690 feet and ranges from 3,114 feet to 13,804 feet at Gannett Peak. Grasshopper and Mormon cricket treatments occur primarily between 3,640 feet and 7,500 feet in this region. Pine forests dominate the higher elevations. No treatments are anticipated in these forested areas. Annual precipitation in the primary area of concern ranges from 6 inches to 22 inches. Precipitation is higher in the mountains.

Temperatures can be extremely variable at any location. Summer temperatures in the 90's and low 100's are common in the lower elevations. Winter low temperatures are often well below 0 degrees Fahrenheit (ºF). The yearly mean temperatures for the region are 40 ºF to 48 ºF.

Croplands are concentrated along major rivers where irrigation is possible. Less than 3% of the region is cultivated. The major crops are:

| CROP | ACRES | CROP | ACRES |
|---|---|---|---|
| Alfalfa | 530,000 | Corn | 110,000 |
| Other Hay | 550,000 | Oats | 23,000 |
| Wheat | 145,000 | Sugar Beets | 31,300 |
| Barley | 100,000 | Dry Beans | 32,000 |

(Acreage figures are from National Agricultural Statistics Service, Wyoming Agriculture Statistics, 2015 Crop Acres Planted). Damage to these croplands is expected when migrating bands of Mormon crickets and grasshoppers enter these fields.

Information on the species composition of grasshoppers is available from USDA APHIS PPQ in Cheyenne, Wyoming through the Wyoming Grasshopper Information System. The species of major economic importance are: *Ageneotettix deorum, Amphitornus coloradus, Anabrus simplex, Aulocara elliotti, Aulocara femoratum, Camnula pellucida, Cordillacris crenulata, Cordillacris occipitalis, Melanoplus bivittatus, M. differentialis, M. femurrubrum, M. infantilis, M. occidentalis, M. sanguinipes, Phlibostroma quadrimaculatum, Phoetaliotes nebrascensis,* and *Trachyrhachys kiowa*. Approximately 96 other lesser important species are represented in surveys from this region. These 96 species may become economic pests if part of a high density species complex. Warm, dry weather is generally the most favorable for high populations, and severe loss of forage most often occurs in conjunction with drought.

The major population centers are in the towns of Cheyenne and Casper. Smaller towns are located throughout the region. The total population is approximately 563,626 (2010 census figure).

Major recreational areas in this region include eleven State parks and eight National Forests. The top five most visited State Parks in Wyoming are Hot Springs State Park with 1,821,006 visitors, Glendo State Park with 300,801 visitors, Bear River State Park with 261,540 visitors, Sinks Canyon State Park with 212,019 visitors and Keyhole State Park with 187,324 visitors in 2014 (Wyoming State Parks Visitor Use Program, 2016). Statistics for 2015 are pending publication. Wyoming's eight National Forests total 9.7 million acres (National Forest Service, 2016). The roads through the region are a major thoroughfare for tourist traffic to and from Wyoming's two National Parks, two National Monuments and over twenty National Historic Sites and Trails. Yellowstone National Park recorded 4,095,317 visitors for 2015 alone and has recorded between 2.8 million and 3.6 million visitors per year since 2000 (Yellowstone National Park Visitor Statistics, 2016).

Domestic honeybee yards are found throughout Wyoming. Approximately 268 hobbyist (10 hives or less) apiarists and 163 general commercial apiarists make up the total registered 431 apiarists who operate 48,000 bee yards and over 100 million bee hives in Wyoming. Most of these colonies seasonally migrate to California to pollinate the almond orchards. Wyoming also has a hearty alfalfa seed production industry and alfalfa leafcutter bees are commonly used in some areas covered by this EA. Site specific locations can be found through apiary registrations at the Wyoming Department of Agriculture or checking with alfalfa seed producers in the case of leafcutter bees (WDA, 2015).

Many species of big game (pronghorn, mule deer, whitetail deer, elk, and others) and smaller animals (rabbits, squirrels, muskrats, beavers, minks, weasels, badgers, coyotes and foxes) range within the varied habitats. Livestock ponds, streams and reservoirs within the proposed treatment area provide a nesting and breeding habitat for waterfowl. Many nongame birds migrate through or nest in the region. Golden eagles, peregrine falcons and other raptors nest within the region and game birds (ringed necked pheasant, Greater Sage-Grouse, wild turkey, Hungarian partridge, chukar and dove) are present. Recreational hunting is very important to the local economy.

## *B. Other Considerations*

### 1. Human Health

The 2002 EIS and 2019 EIS contains detailed hazard, exposure, and risk analyses for the chemicals available to APHIS. Impacts to workers and the general public were analyzed for all possible routes of exposure (dermal, oral, inhalation) under a range of conditions designed to overestimate risk. The operational procedures and spraying conditions examined in those analyses conform to those expected for operations. The following discussion summarizes the hazards, potential exposure, and risk to workers and the general public for operations in Wyoming. Operational procedures identified in Appendix 1 would be required in all cases and further mitigation measures are identified in this section, as appropriate.

No treatment will occur over congested areas, recreation areas, or schools. If appropriate, a buffer zone will be enacted and enforced to ensure treatments do not occur over these areas. Refer to the Operational Procedures for ground and aerial treatments listed in Appendix 1. Further Treatment information can be found in the Grasshopper Guidebook Provisional online at https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/grasshopper-mormon-cricket/ct_grasshopper_mormon_cricket.

Groundwater wells are a major source of domestic water supplies. Groundwater and surface water are the major rural and livestock water source. No groundwater or surface water impacts are anticipated. Strict adherence to label requirements and USDA treatment guidelines (Appendix 1) will be followed regarding treatments bordering open surface waters.

Carbaryl and malathion are cholinesterase inhibitors. Cholinesterases (including AChE) are enzymes that function at the nerve synapse. The nerve synapse is the point where information in the form of electrical impulses is relayed or transmitted by chemical messengers (called transmitters) from one nerve cell to another. Cholinesterase then inactivates or destroys the transmitter chemical (like acetylcholine) after it completes its job, otherwise the transmitter would continue indefinitely and precise control of the enervated tissue (muscle or organ) would be lost. Refer to the 2021 guidelines (Appendix 1) for further information on mitigating exposure to cholinesterase inhibitors.

No human health effects are likely from exposure to diflubenzuron if it is used according to label instructions. A human exposure assessment was done in detail for diflubenzuron and can be found in APHIS's "Chemical Risk Assessment for Diflubenzuron Use in Grasshopper Cooperative Control Program".

## 2. Non-target Species

Sensitive non-target species within the area include plants, terrestrial vertebrates and invertebrates, bats, resident and migratory birds, biocontrol agents, pollinators, aquatic organisms, and Federal and State listed threatened and endangered species. APHIS will use an Integrated Pest Management (IPM) approach to ensure non-target effects are reduced. APHIS will also consult with local agency officials to determine appropriate protective measures. Appropriate protective measures will be considered within an IPM framework. These strategies may include but are not limited to chemical selection, reduced rates, reduced coverage areas, buffer zones, timing restrictions and environmental monitoring. If such a request occurs and the grasshopper or Mormon cricket management option selected poses a clear threat to any of these species, APHIS will confer with the land managers, the U.S. Fish and Wildlife Service and/or WGFD personnel to agree on protective measures.

### a) Threatened and Endangered Species and Sensitive Species of Concern

The following are federally listed threatened and endangered species that reside in Wyoming.

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES:

| Animals | Latin Name | Listed Status |
|---|---|---|
| Northern Long-Eared Bat | *Myotis septentrionalis* | Threatened |
| Grizzly Bear | *Ursus arctos horribilis* | Threatened |
| Humpback Chub | *Gila cypha* | Endangered |
| Yellow-Billed Cuckoo | *Coccyzus americanus* | Threatened |
| Kendall Warm Springs Dace | *Rhinichthys osculus thermalis* | Endangered |
| Black-Footed Ferret | *Mustela nigripes* | Endangered / Experimental |
| Canada Lynx | *Lynx canadensis* | Threatened |
| Preble's Meadow Jumping Mouse | *Zapus hudsonius preblei* | Threatened |

| | | |
|---|---|---|
| Colorado Pikeminnow | *Ptychocheilus lucius* | Endangered |
| Piping Plover | *Charadrius melodus* | Threatened / Endangered |
| Least Tern | *Sterna antillarum* | Endangered |
| Wyoming Toad | *Anaxyrus baxteri* | Endangered |
| Western Glacier Stonefly | *Zapada glacier* | Threatened |

| Plants | Latin Name | Listed Status |
|---|---|---|
| Ute Ladies'-Tresses | *Spiranthes diluvialis* | Threatened |
| Western Prairie Fringed Orchid | *Platanthera praeclara* | Threatened |
| Blowout Penstemon | *Penstemon haydenii* | Endangered |
| Desert Yellowhead | *Yermo xanthocephalus* | Threatened |

A summary of species determinations and impact minimization measures can be found in Appendix 3 of this document. In the absence of a recent national biological opinion, local Section 7 consultations are conducted yearly with the United States Fish and Wildlife Service (USFWS) to mitigate impacts that grasshopper suppression programs may have on listed threatened and endangered species. These correspondences can be found in Appendix 2 of this document.

### b) Greater Sage-Grouse (*Centrocercus urophasianus*)

The Wyoming Game and Fish Department (WGFD) and Bureau of Land Management (BLM) have indicated concern regarding the impacts of a grasshopper suppression program on Greater Sage-Grouse, hereafter referred to as sage-grouse. Potential impacts to sage-grouse from grasshopper suppression programs include: the toxicity effects from the chemicals used in grasshopper suppressions, the effects to the food base of the sage-grouse, and the physical disturbance factors related to a grasshopper suppression program. Wyoming historically supports larger populations of sage-grouse than other states due to the approximately 50% of land area that is composed of sagebrush habitats (Patterson 1952).

Concern and protection of sage-grouse in Wyoming has been a priority for leaders in Wyoming for many years and has been expressed through the Governor's Executive Orders. Throughout the years, Executive Orders 2008-2, 2010-4, 2011-5, 2013-3, 2015-4, and 2017-2 have protected sage-grouse and their habitat and developed management strategies. The Governor's Sage-Grouse Implementation Team developed the sage-grouse core population area concept in order to protect critical habitat from further degradation. Executive Order 2019-3 supersedes all previous executive orders. The BLM currently manages sage-grouse according to the 2015 Record of Decision and Approved Resource Management Plan Amendments for the Rocky Mountain Region on Wyoming BLM Administered Public Lands Including the Federal Mineral Estate.

Sage-grouse as a species of concern was addressed in the 2002 EIS and in the updated 2019 EIS. While it is clear that diflubenzuron poses less direct toxicity to sage-grouse than both carbaryl and malathion, toxicities were analyzed in the risk assessment and concluded that grasshopper suppression RAATs alternatives would not directly affect sage-grouse for any of the proposed insecticides.

The effect of grasshopper suppression programs to the food base of the sage-grouse can be important during the early brood rearing timing of the sage-grouse life cycle. Study results indicate that sage-grouse chicks require insects for survival until about three weeks of age (Johnson, May 1987). For most of Wyoming, this timing coincides with the earliest likely timing of grasshopper suppression programs. In order to limit the effects to the food base of the sage-grouse APHIS PPQ will utilize grasshopper suppression RAATs alternatives within sage-grouse core population areas. By using the RAATs method, effects to non-target insects and grasshoppers will be reduced. The Governor's Executive Order 2019-3 specifically lists Grasshopper/Mormon cricket control following Reduced Agent Area Treatments (RAATs) protocols as a de-minimis (exempt) activity under Appendix G, "De-minimis Activities".

In extreme cases grasshopper infestations may be so damaging that crucial sage-grouse habitat is compromised. These areas may not be apparent in time to use diflubenzuron and a faster knockdown may be required to protect the habitat. For these situations APHIS reserves the ability to use carbaryl and malathion in sage-grouse core population areas. If treatments are late enough in the season that diflubenzuron is deemed ineffective then it is also most likely that sage-grouse chicks will be mature enough that they will have adjusted their diet to a mixture of forbs and sage brush versus insects only. Situations that require the use of carbaryl or malathion within sage-grouse core population areas will be considered on a case by case situation only with input from the land manager, landowner and WGFD.

In 2015 the USFWS requested data from 11 western states, including Wyoming, to aide in the ESA listing decision of the sage-grouse. The data included sage-grouse populations' status, trends and numbers, habitat status and trends, hunting and other uses, disease and predation, impacts from pesticides, contaminants, recreational activities, and any literature pertinent to the USFWS status review. The compiled data demonstrated Wyoming's commitment and assurance to sage-grouse conservation and the determination of the western states to conserve sage-grouse habitat and protect the sage-grouse species logistically and financially. Reviews of the complied data lead to the United States Department of the Interior determining that listing the sage-grouse range wide as a threatened or endangered species was precluded making it a candidate species which will not receive statutory protection under the ESA. Sage-grouse are no longer considered a candidate species by the U.S. Fish and Wildlife Service (50 FR 24292). In the WGFD 2017 State Wildlife Action Plan, sage-grouse are identified as a Tier II SGCN (Tier II is moderate priority). If grasshopper suppression treatments are requested in sage-grouse core population areas, APHIS PPQ will consider additional conditions and mitigation measures outlined in the request. Discussions with local entities such as WGFD and BLM will also occur to determine appropriate steps to suppress grasshopper populations and protect sage-grouse populations and habitat ranges.

### c) Species of Special Concern to the Wyoming Game and Fish Department

The WGFD lists Species of Greatest Conservation Need (SGCN). This list may be found in State Wildlife Action Plan, 2017, which can be found at https://wgfd.wyo.gov/Habitat/Habitat-Plans/Wyoming-State-Wildlife-Action-Plan.

WGFD has specific concerns regarding nongame birds and bats with respect to grasshopper suppression programs.

#### i. Nongame birds

The following species appear on the SGCN list and the Wyoming Partners in Flight Priority Species list, and may be negatively affected by grasshopper control in areas where they nest and forage: burrowing owl, short-eared owl, Brewer's sparrow, sage sparrow, Baird's sparrow, McCown's longspur, loggerhead shrike, sage thrasher, vesper sparrow, lark sparrow, lark bunting, dickcissel, bobolink, black-billed cuckoo, black throated gray warbler, Clark's nutcracker, MacGillivray's warbler, Scott's oriole, Virginia's warbler, Bewick's wren, canyon wren and snowy plover. In particular, the following species consume large amounts of grasshoppers and/or Mormon Crickets; therefore, the impact of grasshopper control on these species is likely to negatively affect both adult and young birds during the nesting season: McCown's longspur, loggerhead shrike, sage thrasher, lark bunting, black-billed cuckoo, Virginia's warbler, Bewick's wren, mountain plover and snowy plover. APHIS would use RAATs methodologies for treatments in most cases, as RAATs with diflubenzuron is the preferred methodology. This method is expected to result in 80 to 95% control, which is approximately 5 to 15% lower mortality than with a conventional (higher rate, blanket coverage) treatment (University of Wyoming, 2010). RAATs methods are expected to leave adequate prey base for insectivorous species. At no time will APHIS strive to eradicate grasshopper populations.

#### ii. Bats

In previous years, the WGFD has raised concerns about possible impacts of this program on spotted bats. The spotted bat is a nocturnal feeder on flying insects primarily around desert water holes. The spotted bat and its food source are protected by the buffers associated with water. Additional protective measures, such as the use of bait or RAATs, will be negotiated with the WGFD if proposed pesticide applications directly conflict with sites having recent spotted bat activity.

The Northern Long-Eared Bat is protected under the Endangered Species Act. More information can be found under Appendix 3: Summary of Species Determinations and Impact Mitigation Measures and Appendix 5: Northern Long-Eared Bat Risk Summary for Grasshopper and Mormon Cricket Suppression Program of this document.

### d) Bald and Golden Eagle Protection Act

The Eagle Act (16 United State Code (U.S.C.) 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the

Interior, from “taking” bald eagles, including their parts, nests, or eggs. The Eagle Act provides criminal and civil penalties for persons who “take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof.” The Eagle Act defines “take” as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” “Disturb’’ means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.

As listed in the National Bald Eagle Management Guidelines (USFWS, May 2007) the following mitigation measures will be followed when practical:

> “Category G. Helicopters and fixed-wing aircraft. Except for authorized biologists trained in survey techniques, avoid operating aircraft within 1,000 feet of the nest during the breeding season, except where eagles have demonstrated tolerance for such activity. In addition, Category A (Agriculture) and Category D (Off Road Vehicle Use) both provide the same guidance for use of ATV's or trucks: No buffer is necessary around nest sites outside the breeding season. During the breeding season, do not operate off-road vehicles within 330 feet of the nest. In open areas, where there is increased visibility and exposure to noise, this distance should be extended to 660 feet.”

Most bald eagles nest close to their food source, typically waterways, by policy and label restrictions APHIS will not conduct suppression activities within 500 feet of water bodies providing some inherent protection for Bald Eagles.

### e) Aquatic Species not Previously Listed

Important game fish in the region include: walleye, sauger, cutthroat trout, brown trout, rainbow trout, brook trout and lake trout.

EPA lists carbaryl as a pesticide that may affect endangered aquatic species (EPA, 1986). APHIS evaluated the potential human health and ecological risks from the proposed use of carbaryl ULV sprays and carbaryl bait applications and determined that the risks to human health and the environment, including aquatic areas, are low (USDA APHIS 2019).

Diflubenzuron is the main ingredient in Dimilin® 2L, Cavalier 2L and Unforgiven. These chemical products are listed as Restricted Use Pesticides due to toxicity to aquatic invertebrate animals including insects and it cannot be applied directly to water or to areas where surface water is present.

EPA also lists malathion as a pesticide that may affect endangered aquatic species (EPA, 1986). The malathion label warns of its toxicity to fish, shrimp, and crabs and prohibits its use over water.

Programmatic protection for federally listed endangered and threatened species of aquatic animals is covered in the 2002 EIS, Biological Assessment, and the Biological Opinion as well as in the 2019 EIS, Biological Assessment, and the Biological Opinion. These procedures will ensure protection of sensitive aquatic species from any adverse effects caused by grasshopper control.

### f) Bees

i. Domestic Honey Bees (*Apis mellifera*)

Beekeepers are given notice when definitive treatment areas are identified. Treatment block maps will be available for beekeeper review at the County offices of the Weed and Pest Districts. Beekeepers will be advised to move their bees at least two miles from the spray block boundaries. In all cases when using carbaryl or malathion where beekeepers fail to move or otherwise protect their bees, a two mile buffer zone will be observed around the bee yard. The above procedures will ensure that there will be no significant impact on domestic bee production.

ii. Alfalfa Leafcutter Bees (*Megachile rotundata*)

Alfalfa leafcutter bees are managed for pollination of alfalfa in the area. The areas with these bees are mostly centered at Basin, Burlington, Emblem, Powell, Byron, Lovell and Riverton. Notification is on a case-by-case basis. Beekeepers will be advised to move their bees at least four miles from the spray block boundaries. In all cases when using carbaryl or malathion where beekeepers fail to move or otherwise protect their bees, a four mile buffer zone will be observed around the bee yard. The above procedures will ensure that there will be no significant impact on alfalfa leafcutter bee activity.

### g) Migratory Birds

In accordance with various environmental statutes, APHIS routinely conducts programs in a manner that minimizes impact to the environment, including any impact to migratory birds. In January 2001, President Clinton signed Executive Order (EO) number 13186 to ensure that all government programs protect migratory birds to the extent practicable. APHIS will support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions.

### h) Protective Mitigation Measures of Above Species

Protective mitigation measures that may be taken by APHIS in the grasshopper treatment areas covered by this EA may include, but is not limited to, buffer zones and/or skip swaths. It is important to note that treatment goals are to reduce grasshopper populations to an economic threshold, not eradication. At no time will APHIS strive to reduce populations below levels encountered in non-outbreak years. This will help ensure grasshopper populations sufficient to provide food sources and biodiversity for species of concern.

If after specific program boundaries have been set and if it has been determined by Fish and Wildlife Services or the land manager that species of concern are within the specific area, mitigation measures as described in Appendix 3 or site specific documentation will be followed.

## 3. Socioeconomic Issues

The possible treatment areas are subject to reoccurring drought. A combination of drought and grasshopper damage causes economic stress to landowners and permittees.

The control of grasshoppers and Mormon crickets in this area would have beneficial economic impacts to local landowners (or permittees). The forage not utilized by grasshoppers will be available for wildlife consumption, livestock consumption, and harvesting. This will allow greater livestock grazing, decreased needs for supplemental feed, and increased monetary returns. The control of migrating bands of Mormon crickets is most important in protection of crops but if populations are extreme, damage to rangeland forage will occur.

### a) Wildlife Habitat Reservations and Wilderness Areas

The WGFD operates 39 Wildlife Habitat Management Units in Wyoming. These can be located on the web at https://wgfd.wyo.gov/accessto/whmas.asp. If a request for treatment involves any of these lands, APHIS will negotiate locally with the habitat biologist located at the nearest Game and Fish regional office for any protective measures necessary, in addition to the operation procedures.

### b) Bureau of Land Management Wilderness Study Areas

In Wyoming there are 43 Bureau of Land Management (BLM) administered Wilderness Study Areas (WSA), encompassing 588,150 acres. These can be located on the web at https://www.blm.gov/programs/national-conservation-lands/wyoming. These WSA's are managed under BLM's Interim Management Policy (IMP).

The objective of the IMP is to continue resource uses within the WSA's in a manner that maintains the area's suitability for preservation as wilderness until Congress either designates these lands as wilderness or releases them for other purposes.

Handbook H-8550-1 (Interim Management Policy for Lands under Wilderness Review) provides guidance regarding how BLM will manage the WSA's. H-8550-1 does provide for insect and disease control by chemical or biological means under certain conditions as discussed in Chapter 3, Section D Rangeland Management, 4 e.

Because of the special requirements found in H-8550-1, including NEPA related requirements, before conducting any Grasshopper and Mormon cricket project involving a WSA, the BLM Field Office administering the specific WSA will be consulted with and involved in the project.

## 4. Cultural Resources and Events

To ensure that historical sites, monuments, buildings, artifacts or known areas of cultural events and/or observances of special concern are not adversely affected by program treatments, APHIS will confer locally with Tribes, state and federal land managers on proposed treatment areas.

In previous years, BLM has expressed concerns regarding the effect of pesticide applications on cation ratio dating techniques of pictographs and petroglyphs. There is presently no information on this subject. Until such information is available, USDA APHIS will confer with BLM on a local level to protect known sites on BLM managed lands.

Where tribal lands are involved, APHIS will confer locally with Tribal Officials and with the BIA office to ensure that the timing and location of planned program treatments do not coincide or conflict with cultural events and/or observances on Tribal and/or allotted lands. APHIS will confer locally with Tribal Officials and with the BIA office on possible cultural impacts of proposed grasshopper/Mormon cricket treatment where native plant gathering areas on tribal land are identified to APHIS.

## 5. Special Considerations for Certain Populations

### a) Executive Order Number 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order (EO) number 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was signed by President Clinton on February 11, 1994 (59 *Federal Register* (FR) 7269). This EO requires each Federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Consistent with this EO, APHIS will consider the potential for disproportionately high and adverse human health or environmental effects on minority populations and low-income populations for any of its actions related to grasshopper suppression programs.

Consistent with EO number 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, APHIS considered the potential for disproportionately high and adverse human health or environmental effects from the proposed treatment is minimal and is not expected to have disproportionate adverse effects to any minority or low income populations.

**b) Executive Order Number 13045, Protection of Children from Environmental Health Risks and Safety Risks**

The increased scientific knowledge about the environmental health risks and safety risks associated with hazardous substance exposures to children and recognition of these issues in Congress and Federal agencies brought about legislation and other requirements to protect the health and safety of children. On April 21, 1997, President Clinton signed EO number 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 FR 19885). This EO requires each Federal agency, consistent with its mission, to identify and assess environmental health risks and safety risks that may disproportionately affect children and to ensure that its policies, programs, activities, and standards address those risks. APHIS has developed agency guidance for its programs to follow to ensure the protection of children (USDA, APHIS, 1999).

The human health risk assessment for the 2002 EIS analyzed the effects of exposure to children from three insecticides. The 2019 EIS updates and replaces the 2002 EIS. Based on review of all four insecticides and their use in the grasshopper program, the risk assessment concluded that the likelihood of children being exposed to insecticides is very slight and that no disproportionate adverse effects to children are anticipated over the negligible effects to the general population. Treatments are primarily conducted on open rangelands where children would not be expected to be present during treatment or enter should there be any restricted entry period after treatment. No treatment will occur over congested areas or schools and if appropriate, a buffer zone will be enacted and enforced.

Impacts on children will be minimized by the implementation of the treatment guidelines as further described in Appendix 1:

Aerial Broadcast Applications of Liquid Insecticides

- Notify all residents in treatment areas, or their designated representatives, prior to proposed operations. Advise them of the control method to be used, the proposed method of application, and precautions to be taken (e.g., advise parents to keep children and pets indoors during ULV treatment). Refer to label recommendations related to restricted entry period.

- No treatments will occur over congested urban areas. For all flights over congested areas, the contractor must submit a plan to the appropriate Federal Aviation Administration District Office and this office must approve of the plan; a letter of authorization signed by city or town authorities must accompany each plan. Whenever possible, plan aerial ferrying and turnaround routes to avoid flights over congested areas, bodies of water, and other sensitive areas that are not to be treated.

Aerial Application of Dry Insecticidal Bait

- Do not apply within 500 feet of any school or recreational facility.

Ultra-Low-Volume Aerial Application of Liquid Insecticides
- Do not spray while school buses are operating in the treatment area.
- Do not apply within 500 feet of any school or recreational facility.

# IV. Environmental Consequences

Each alternative described in this EA potentially has adverse environmental effects. The general environmental impacts of each alternative are discussed in detail in the 2002 and 2019 EIS. The specific impacts of the alternatives are highly dependent upon the particular action and location of infestation. The principal concerns associated with the alternatives are: (1) the potential effects of insecticides on human health (including subpopulations that might be at increased risk); and (2) impacts of insecticides on non-target organisms (including threatened and endangered species).

APHIS has written human health and ecological risk assessments (HHERAs) to assess the insecticides and use patterns that are specific to the program. The risk assessments provide an in-depth technical analysis of the potential impacts of each insecticide to human health; and non-target fish and wildlife along with its environmental fate in soil, air, and water. The assessments rely on data required by the USEPA for pesticide product registrations, as well as peer-reviewed and other published literature. The HHERAs are heavily referenced in this Final EA. These Environmental Documents can be found at the following website: http://www.aphis.usda.gov/plant-health/grasshopper.

## *A. Environmental Consequences of the Alternatives*

Environmental consequences of the alternatives are discussed in this section.

### 1. No Suppression Program Alternative

Under this alternative, APHIS would not organize or fund a program to suppress grasshoppers. If APHIS does not participate in any grasshopper suppression program, Federal land management agencies, State agriculture departments, local governments, private groups or individuals, may not effectively combat outbreaks in a coordinated effort. Without the technical assistance and coordination that APHIS provides during grasshopper outbreaks, the uncoordinated programs could use insecticides that APHIS considers too environmentally harsh. Multiple treatments and excessive amount of insecticide could be applied in efforts to suppress or even locally eradicate grasshopper populations. There are approximately 100 pesticide products registered by USEPA for use on rangelands and against grasshoppers (Purdue University, 2018). It is not possible to accurately predict the environmental consequences of the No Suppression alternative because the type and amount of insecticides that could be used in this scenario are unknown. However, the environmental impacts could be much greater than under the APHIS led suppression program alternative due to lack of treatment knowledge or coordination among the groups.

The potential environmental impacts from the No Suppression alternative, where other agencies and land managers do not control outbreaks, stem primarily from grasshoppers consuming vast amounts of vegetation in rangelands and surrounding areas. Grasshoppers are general feeders, eating grasses and forbs first and often moving to cultivated crops. High grasshopper density of one or several species and the resulting defoliation may reach an economic threshold where the damage caused by grasshoppers exceeds the cost of controlling the grasshoppers. Researchers determined that during typical grasshopper infestation years, approximately 20% of forage rangeland is removed, valued at a dollar adjusted amount of $900 million. This value represents 32 to 63% of the total value of rangeland across the western states (Rashford et al., 2012). Other market and non-market values such as carbon sequestration, general ecosystem services, and recreational use may also be impacted by pest outbreaks in rangeland.

Vegetation damage during large-scale grasshopper outbreaks may be so severe that grasses and forbs are destroyed, resulting in poor or impaired plant growth for several years. Grasshoppers in unsuppressed outbreaks would consume agricultural and nonagricultural plants. Rare, threatened or endangered plants may be consumed during critical times of development such as seed production, and loss of important plant species, or seed production may lead to reduced diversity of rangeland habitats, potentially creating opportunities for the expansion of invasive and exotic weeds (Lockwood and Latchininsky, 2000). When grasshoppers consume plant cover, soil is more susceptible to the drying effects of the sun, making plant roots less capable of holding soil in place. Soil damage results in erosion and disruption of nutrient cycling, water infiltration, seed germination, and other ecological processes which are important components of rangeland ecosystems (Latchininsky et al., 2011).

When the density of grasshoppers reaches significantly high levels, grasshoppers begin to compete with livestock for food by reducing available forage (Wakeland and Shull, 1936; Belovsky, 2000; Pfadt, 2002; Branson et al., 2006; Bradshaw et al., 2018). Ranchers could offset some of the costs by leasing rangeland in another area and relocating their livestock, finding other means to feed their animals by purchasing hay or grain, or selling their livestock. Ranchers could also incur economic losses from personal attempts to control grasshopper damage. Local communities could see adverse economic impacts to the entire area. Grasshoppers that infest rangeland could move to surrounding croplands. Farmers could incur economic losses from attempts to chemically control grasshopper populations or due to the loss of their crops. The general public could see an increase in the cost of meat, crops, and their byproducts.

### 2. Insecticide Applications at Conventional Rates or Reduced Agent Area Treatments with Adaptive Management Strategy

Under Alternative 2, APHIS would participate in grasshopper programs with the option of using one of the insecticides carbaryl, diflubenzuron, or malathion depending upon the various factors related to the grasshopper outbreak and the site specific characteristics. The use of an insecticide would typically occur at half the conventional application rates following the RAATs strategy. APHIS would apply a single treatment to affected rangeland areas in an attempt to suppress grasshopper outbreak populations by a range of 35 to 98%, depending upon the insecticide used.

### a) Carbaryl

Carbaryl is a member of the N-methyl carbamate class of insecticides, which affect the nervous system via cholinesterase inhibition. Inhibiting the enzyme acetylcholinesterase (AChE) causes nervous system signals to persist longer than normal. While these effects are desired in controlling insects, they can have undesirable impacts to non-target organisms that are exposed. The APHIS HHERA assessed available laboratory studies regarding the toxicity of carbaryl on fish and wildlife. In summary, the document indicates the chemical is highly toxic to insects, including native bees, honeybees, and aquatic insects; slightly to highly toxic to fish; highly to very highly toxic to most aquatic crustaceans, moderately toxic to mammals, minimally toxic to birds; moderately to highly toxic to several terrestrial arthropod predators; and slightly to highly toxic to larval amphibians (USDA APHIS, 2018a). However, adherence to label requirements and additional program measures designed to prevent carbaryl from reaching sensitive habitats or mitigate exposure of non-target organisms will reduce environmental effects of treatments.

The offsite movement and deposition of carbaryl after treatments is unlikely because it does not significantly vaporize from the soil, water, or treated surfaces (Dobroski et al., 1985). Temperature, pH, light, oxygen, and the presence of microorganisms and organic material are factors that contribute to how quickly carbaryl will degrade in water. Hydrolysis, the breaking of a chemical bond with water, is the primary degradation pathway for carbaryl at pH 7 and above. In natural water, carbaryl is expected to degrade faster than in laboratory settings due to the presence of microorganisms. The half-lives of carbaryl in natural waters varied between 0.3 to 4.7 days (Stanley and Trial, 1980; Bonderenko et al., 2004). Degradation in the latter study was temperature dependent with shorter half-lives at higher temperatures. Aerobic aquatic metabolism of carbaryl reported half-life ranged of 4.9 to 8.3 days compared to anaerobic (without oxygen) aquatic metabolism range of 15.3 to 72 days (Thomson and Strachan, 1981; USEPA, 2003). Carbaryl is not persistent in soil due to multiple degradation pathways including hydrolysis, photolysis, and microbial metabolism. Little transport of carbaryl through runoff or leaching to groundwater is expected due to the low water solubility, moderate sorption, and rapid degradation in soils. There are no reports of carbaryl detection in groundwater, and less than 1% of granule carbaryl applied to a sloping plot was detected in runoff (Caro et al., 1974).

Acute and chronic risks to mammals are expected to be low to moderate based on the available toxicity data and conservative assumptions that were used to evaluate risk. There is the potential for impacts to small mammal populations that rely on terrestrial invertebrates for food. However, based on the toxicity data for terrestrial plants, minimal risks of indirect effects are expected to mammals that rely on plant material for food. Carbaryl has a reported half-life on vegetation of three to ten days, suggesting mammal exposure would be short-term. Direct risks to mammals from carbaryl bait applications is expected to be minimal based on oral, dermal, and inhalation studies (USDA APHIS, 2018a).

A number of studies have reported no effects on bird populations in areas treated with carbaryl (Buckner et al., 1973; Richmond et al., 1979; McEwen et al., 1996). Some applications of formulated carbaryl were found to cause depressed AChE levels (Zinkl et al., 1977; Gramlich, 1979); however, the doses were twice those proposed for the full coverage application in the grasshopper program.

While sublethal effects have been noted in fish with depressed AChE, as well as some impacts to amphibians (i.e. days to metamorphosis) and aquatic invertebrates in the field due to carbaryl, the application rates and measured aquatic residues observed in these studies are well above values that would be expected from current program operations. Indirect risks to amphibian and fish species can occur through the loss of habitat or reduction in prey, yet data suggests that carbaryl risk to aquatic plants that may serve as habitat, or food, for fish and aquatic invertebrates is very low.

Product use restrictions appear on the USEPA-approved label and attempt to keep carbaryl out of waterways. Carbaryl must not be applied directly to water, or to areas where surface water is present (USEPA, 2012c). The USEPA-approved use rates and patterns and the additional mitigations imposed by the grasshopper program, such as using RAATs and application buffers, where applicable, further minimize aquatic exposure and risk.

The majority of rangeland plants require insect-mediated pollination. Native, solitary bee species are important pollinators on western rangeland (Tepedino, 1979). Potential negative effects of insecticides on pollinators are of concern because a decrease in their numbers has been associated with a decline in fruit and seed production of plants. Laboratory studies have indicated that bees are sensitive to carbaryl applications, but the studies were at rates above those proposed in the program. The reduced rates of carbaryl used in the program and the implementation of application buffers should significantly reduce exposure of carbaryl applications to pollinators. In areas of direct application where impacts may occur, alternating swaths and reduced rates (i.e., RAATs) would reduce risk. Potential negative effects of grasshopper program insecticides on bee populations may also be mitigated by the more common use of carbaryl baits than the ULV spray formulation. Studies with carbaryl bran bait have found no sublethal effects on adults or larvae bees (Peach et al., 1994, 1995).

Carbaryl can cause cholinesterase inhibition (i.e., overstimulate the nervous system) in humans resulting in nausea, headaches, dizziness, anxiety, and mental confusion, as well as convulsions, coma, and respiratory depression at high levels of exposure (NIH, 2009a; Beauvais, 2014). USEPA classifies carbaryl as “likely to be carcinogenic to humans” based on vascular tumors in mice (USEPA, 2007, 2015a, 2017a).

USEPA regulates the amount of pesticide residues that can remain in or on food or feed commodities as the result of a pesticide application. The agency does this by setting a tolerance, which is the maximum residue level of a pesticide, usually measured in parts per million (ppm), that can legally be present in food or feed. USEPA-registered carbaryl products used by the grasshopper program are labeled with rates and treatment intervals that are meant to protect livestock and keep chemical residues in cattle at acceptable levels (thereby protecting human health). While livestock and horses may graze on rangeland the same day that the land is sprayed, in order to keep tolerances to acceptable levels, carbaryl spray applications on rangeland are limited to half a pound active ingredient per acre per year (USEPA, 2012c). The grasshopper program would treat at or below use rates that appear on the label, as well as follow all appropriate label mitigations, which would ensure residues are below the tolerance levels.

Adverse human health effects from the proposed program ULV applications of the carbaryl spray (Sevin® XLR Plus) and bait applications of the carbaryl 5% and 2% baits formulations to control grasshoppers are not expected based on low potential for human exposure to carbaryl and the favorable environmental fate and effects data. Technical grade (approximately 100% of the insecticide product is composed of the active ingredient) carbaryl exhibits moderate acute oral toxicity in rats, low acute dermal toxicity in rabbits, and very low acute inhalation toxicity in rats. Technical carbaryl is not a primary eye or skin irritant in rabbits and is not a dermal sensitization in guinea pig (USEPA, 2007). This data can be extrapolated and applied to humans revealing low health risks associated with carbaryl.

The Sevin® XLR Plus formulation, which contains a lower percent of the active ingredient than the technical grade formulation, is less toxic via the oral route, but is a mild irritant to eyes and skin. The proposed use of carbaryl as a ULV spray or a bait, use of RAATs, and adherence to label requirements, substantially reduces the potential for exposure to humans. Program workers are the most likely human population to be exposed. APHIS does not expect adverse health risks to workers based on low potential for exposure to carbaryl when applied according to label directions and use of personal protective equipment (PPE) (e.g., long-sleeved shirt and long pants, shoes plus socks, chemical-resistant gloves, and chemical-resistant apron) (USEPA, 2012c) during loading and applications. APHIS quantified the potential health risks associated with accidental worker exposure to carbaryl during mixing, loading, and applications. The quantitative risk evaluation results indicate no concerns for adverse health risk for program workers (http://www.aphis.usda.gov/plant-health/grasshopper).

Adherence to label requirements and additional program measures designed to reduce exposure to workers and the public (e.g., mitigations to protect water sources, mitigations to limit spray drift, and restricted-entry intervals) result in low health risk to all human population segments.

#### b) Diflubenzuron

Diflubenzuron is a restricted use pesticide (only certified applicators or persons under their direct supervision may make applications) registered with USEPA as an insect growth regulator. It specifically interferes with chitin synthesis, the formation of the insect's exoskeleton. Larvae of affected insects are unable to molt properly. While this effect is desirable in controlling certain insects, it can have undesirable impacts to non-target organisms that are exposed.

USEPA considers diflubenzuron relatively non-persistent and immobile under normal use conditions and stable to hydrolysis and photolysis. The chemical is considered unlikely to contaminate ground water or surface water (USEPA, 1997). The vapor pressure of diflubenzuron is relatively low, as is the Henry's Law Constant value, suggesting the chemical will not volatilize readily into the atmosphere from soil, plants or water. Therefore, exposure from volatilization is expected to be minimal. Due to its low solubility (0.2 mg/L) and preferential binding to organic matter, diflubenzuron seldom persists more than a few days in water (Schaefer and Dupras, 1977; Schaefer et al., 1980). Mobility and leachability of diflubenzuron in soils is low, and residues are usually not detectable after seven days (Eisler, 2000). Aerobic aquatic half-life data in water and sediment was reported as 26.0 days (USEPA, 1997). Diflubenzuron applied to foliage remains adsorbed to leaf surfaces for several weeks with little or no absorption or translocation from plant surfaces (Eisler, 1992, 2000). Field dissipation studies in California citrus and Oregon apple orchards reported half-live values of 68.2 to 78 days (USEPA, 2018). Diflubenzuron persistence varies depending on site conditions and rangeland persistence is unfortunately not available. Diflubenzuron degradation is microbially mediated with soil aerobic half-lives much less than dissipation half-lives. Diflubenzuron treatments are expected to have minimal effects on terrestrial plants. Both laboratory and field studies demonstrate no effects using diflubenzuron over a range of application rates, and the direct risk to terrestrial plants is expected to be minimal (USDA APHIS, 2018c).

Dimilin® 2L is labeled with rates and treatment intervals that are meant to protect livestock and keep residues in cattle at acceptable levels (thereby, protecting human health). Tolerances are set for the amount of diflubenzuron that is allowed in cattle fat (0.05 ppm) and meat (0.05 ppm) (40 CFR Parts 180.377). The grasshopper program would treat at application rates indicated on product labels or lower, which should ensure approved residues levels.

APHIS' literature review found that on an acute basis, diflubenzuron is considered toxic to some aquatic invertebrates and practically non-toxic to adult honeybees. However, diflubenzuron is toxic to larval honeybees (USEPA, 2018). It is slightly nontoxic to practically nontoxic to fish and birds and has very slight acute oral toxicity to mammals, with the most sensitive endpoint from exposure being the occurrence of methemoglobinemia (a condition that impairs the ability of the blood to carry oxygen). Minimal direct risk to amphibians and reptiles is expected, although there is some uncertainty due to lack of information (USDA APHIS, 2018c; USEPA, 2018).

Risk is low for most non-target species based on laboratory toxicity data, USEPA approved use rates and patterns, and additional mitigations such as the use of lower rates and RAATs that further reduces risk. Risk is greatest for sensitive terrestrial and aquatic invertebrates that may be exposed to diflubenzuron residues.

In a review of mammalian field studies, Dimilin® applications at a rate of 60 to 280 g a.i./ha had no effects on the abundance and reproduction in voles, field mice, and shrews (USDA FS, 2004). These rates are approximately three to 16 times greater than the highest application rate proposed in the program. Potential indirect impacts from application of diflubenzuron on small mammals includes loss of habitat or food items. Mice on treated plots consumed fewer lepidopteran (order of insects that includes butterflies and moths) larvae compared to controls; however, the total amount of food consumed did not differ between treated and untreated plots. Body measurements, weight, and fat content in mice collected from treated and non-treated areas did not differ.

Poisoning of insectivorous birds by diflubenzuron after spraying in orchards at labeled rates is unlikely due to low toxicity (Muzzarelli, 1986). The primary concern for bird species is related to an indirect effect on insectivorous species from a decrease in insect prey. At the proposed application rates, grasshoppers have the highest risk of being impacted while other taxa have a much reduced risk because the lack of effects seen in multiple field studies on other taxa of invertebrates at use rates much higher than those proposed for the program. Shifting diets in insectivorous birds in response to prey densities is not uncommon in undisturbed areas (Rosenberg et al., 1982; Cooper et al., 1990; Sample et al., 1993).

Indirect risk to fish species can be defined as a loss of habitat or prey base that provides food and shelter for fish populations, however these impacts are not expected based on the available fish and invertebrate toxicity data (USDA APHIS, 2018c). A review of several aquatic field studies demonstrated that when effects were observed it was at diflubenzuron levels not expected from program activities (Fischer and Hall, 1992; USEPA, 1997; Eisler, 2000; USDA USFS, 2004).

Diflubenzuron applications have the potential to affect chitin production in various other beneficial terrestrial invertebrates. Multiple field studies in a variety of application settings, including grasshopper control, have been conducted regarding the impacts of diflubenzuron to terrestrial invertebrates. Based on the available data, sensitivity of terrestrial invertebrates to diflubenzuron is highly variable depending on which group of insects and which life stages are being exposed. Immature grasshoppers, beetle larvae, lepidopteran larvae, and chewing herbivorous insects appear to be more susceptible to diflubenzuron than other invertebrates. Within this group, however, grasshoppers appear to be more sensitive to the proposed use rates for the program. Honeybees, parasitic wasps, predatory insects, and sucking insects show greater tolerance to diflubenzuron exposure (Murphy et al., 1994; Eisler, 2000; USDA USFS, 2004).

Diflubenzuron is moderately toxic to spiders and mites (USDA APHIS, 2018c). Deakle and Bradley (1982) measured the effects of four diflubenzuron applications on predators of *Heliothis* spp. at a rate of 0.06 lb a.i./ac and found no effects on several predator groups. This supported earlier studies by Keever et al. (1977) that demonstrated no effects on the arthropod predator community after multiple applications of diflubenzuron in cotton fields. Grasshopper integrated pest management (IPM) field studies have shown diflubenzuron to have a minimal impact on ants, spiders, predatory beetles, and scavenger beetles. There was no significant reduction in populations of these species from seven to 76 days after treatment. Although ant populations exhibited declines of up to 50%, these reductions were temporary, and population recovery was described as immediate (Catangui et al., 1996).

Due to its mode of action, diflubenzuron has greater activity on immature stages of terrestrial invertebrates. Based on standardized laboratory testing diflubenzuron is considered practically non-toxic to adult honeybees. The contact LD50 value for the honeybee, *Apis mellifera*, is reported at greater than 114.8 µg a.i./bee while the oral LD50 value was reported at greater than 30 µg a.i./bee. USEPA (2018) reports diflubenzuron toxicity values to adult honeybees are typically greater than the highest test concentration using the end-use product or technical active ingredient. The lack of toxicity to honeybees, as well as other bees, in laboratory studies has been confirmed in additional studies (Nation et al., 1986; Chandel and Gupta, 1992; Mommaerts et al., 2006). Mommaerts et al. (2006) and Thompson et al. (2005) documented sublethal effects on reproduction-related endpoints for the bumble bee, *Bombus terrestris* and *A. mellifera*, respectively, testing a formulation of diflubenzuron. However, these effects were observed at much higher use rates relative to those used in the program

Insecticide applications to rangelands have the potential to impact pollinators, and in turn, vegetation and various rangeland species that depend on pollinated vegetation. Based on the review of laboratory and field toxicity data for terrestrial invertebrates, applications of diflubenzuron are expected to have minimal risk to pollinators of terrestrial plants. The use of RAATs provide additional benefits by using reduced rates and creating untreated swaths within the spray block that will further reduce the potential risk to pollinators.

APHIS reduces the risk to native bees and pollinators through monitoring grasshopper and Mormon cricket populations and making pesticide applications in a manner that reduces the risk to this group of nontarget invertebrates. Monitoring grasshopper and Mormon cricket populations allows APHIS to determine if populations require treatment and to make treatments in a timely manner reducing pesticide use and emphasizing the use of Program insecticides that are not broad spectrum. Historical use of Program insecticides demonstrate that diflubenzuron is the preferred insecticide for use. Over 90% of the acreage treated by the Program has been with diflubenzuron. Diflubenzuron poses a reduced risk to native bees and pollinators compared to liquid carbaryl and malathion applications.

Adverse human health effects from ground or aerial ULV applications of diflubenzuron to control grasshoppers are not expected based on the low acute toxicity of diflubenzuron and low potential for human exposure. The adverse health effects of diflubenzuron to mammals and humans involves damage to hemoglobin in blood and the transport of oxygen. Diflubenzuron causes the formation of methemoglobin. Methemoglobin is a form of hemoglobin that is not able to transport oxygen (USDA FS, 2004). USEPA classifies diflubenzuron as non-carcinogenic to humans (USEPA, 2015b).

Program workers adverse health risks are not likely when diflubenzuron is applied according to label directions that reduce or eliminate exposures. Adverse health risk to the general public in treatment areas is not expected due to the low potential for exposure resulting from low population density in the treatment areas, adherence to label requirements, program measures designed to reduce exposure to the public, and low toxicity to mammals.

#### c) Malathion

Malathion is a broad-spectrum organophosphate insecticide widely used in agriculture on various food and feed crops, homeowner yards, ornamental nursery stock, building perimeters, pastures and rangeland, and regional pest eradication programs. The chemical's mode of action is through AChE inhibition, which disrupts nervous system function. While these effects are desired in controlling insects, they can have undesirable impacts to non-target organisms that are exposed to malathion. The grasshopper program currently uses the malathion end-use product Fyfanon® ULV AG, applied as a spray by ground or air.

Volatility is not expected to be a major pathway of exposure based on the low vapor pressure and Henry's Law constant that have been reported for malathion. The atmospheric vapor phase half-life of malathion is five hours (NIH, 2009b). Malathion's half-life in pond, lake, river, and other natural waters varied from 0.5 days to ten days, depending on pH (Guerrant et al., 1970), persisting longer in acidic aquatic environments. The reported half-life in water and sediment for the anaerobic aquatic metabolism study was 2.5 days at a range of pH values from 7.8 to 8.7 (USEPA, 2006). The persistence of malathion in soils depends primarily on microorganism activity, pH, and organic matter content. The persistence of malathion is decreased with microbial activity, moisture, and high pH (USEPA, 2016a) and the half-life of malathion in natural soil varies from two hours (Miles and Takashima, 1991) to 11 days (Neary, 1985; USEPA, 2006).

Malathion and associated degradates, in general, are soluble and do not adsorb strongly to soils (USEPA, 2000a). Inorganic degradation of malathion may be more important in soils that are relatively dry, alkaline, and low in organic content, such as those that predominate in the western program areas. Adsorption to organic matter and rapid degradation make it unlikely that detectable quantities of malathion would leach to groundwater (LaFleur, 1979). Malathion degradation products also have short half-lives. Malaoxon, the major malathion degradation product of toxicological concern, has half-lives less than one day in a variety of soil types (USEPA, 2016a). The half-life of malathion on foliage has been shown to range from one to six days (El-Refai and Hopkins, 1972; Nigg, 1986; Matsumara, 1985; USDA FS, 2008).

While livestock and horses may graze on rangeland the same day that the land is treated with malathion, the products used by the grasshopper program are labeled with rates and treatment intervals that are meant to protect livestock. Tolerances are set for the amount of malathion that is allowed in cattle fat (4 ppm), meat (4 ppm), and meat byproducts (4 ppm) (40 CFR Parts 180.111). The grasshopper program would treat at application rates indicated on product labels or lower, which would ensure approved residues levels. In addition, the program would make only one application a year.

USEPA found malathion moderately toxic to birds on a chronic basis, slightly toxic to mammals through dietary exposure, and acutely toxic to aquatic species (including freshwater as well as estuarine and marine species) (USEPA, 2000b, 2016b). Toxicity to aquatic vertebrates such as fish and larval amphibians, and aquatic invertebrates is variable based on test species and conditions. The data available on impacts to fish from malathion suggest effects could occur at levels above those expected from program applications. Consumption of contaminated prey is not expected to be a significant pathway of exposure for aquatic species based on expected residues and malathion's BCF

(USEPA, 2016a; USDA APHIS, 2018d). Indirect effects to fish from impacts of malathion applications to aquatic plants are not expected (USDA APHIS, 2018d).

USEPA considers malathion highly toxic to bees if exposed to direct treatment on blooming crops or weeds. The Fyfanon® ULV AG label indicates not to apply product or allow it to drift to blooming crops or weeds while bees are actively visiting the treatment area (USEPA, 2012a). Toxicity to other terrestrial invertebrates is variable based on the test organism and test conditions however malathion is considered toxic to most terrestrial invertebrates (USEPA, 2016b).

Indirect risks to mammals resulting from the loss of plants that serve as a food source would also be low due to the low phytotoxicity of malathion. The other possible indirect effect that should be considered is loss of invertebrate prey for those mammals that depend on insects and other invertebrates as a food source. Insects have a wide variety of sensitivities to malathion and a complete loss of invertebrates from a treated area is not expected because of low program rates and application techniques. In addition, the aerial and ground application buffers and untreated swaths provide refuge for invertebrates that serve as prey for insectivorous mammals and would expedite repopulation of areas that may have been treated.

APHIS expects that direct avian acute and chronic effects would be minimal for most species (USDA APHIS, 2018d). The preferred use of RAATs during application reduces these risks by reducing residues on treated food items and reducing the probability that they will only feed on contaminated food items. In addition, malathion degrades quickly in the environment and residues on food items are not expected to persist. Indirect effects on birds from the loss of habitat and food items are not expected because of malathion's low toxicity to plants and the implementation of RAATs that would reduce the potential impacts to invertebrates that serve as prey for avian species. Several field studies did not find significant indirect effects of malathion applications on avian fecundity (Dinkins et al., 2002; George et al., 1995; Howe, 1993; Howe et al., 1996; Norelius and Lockwood, 1999; Pascual, 1994).

Available toxicity data demonstrates that amphibians are less sensitive to malathion than fish. Program malathion residues are more than 560 times below the most sensitive acute toxicity value for amphibians. Sublethal effects, such as developmental delays, reduced food consumption and body weight, and teratogenesis (developmental defects that occur during embryonic or fetal growth), have been observed at levels well above those assessed from the program's use of malathion (USDA APHIS, 2018d). Program protection measures for aquatic water bodies and the available toxicity data for fish, aquatic invertebrates, and plants suggest low indirect risks related to reductions in habitat or aquatic prey items from malathion treatments.

Available data on malathion reptile toxicity suggest that, with the use of program measures, no lethal or sublethal impacts would be anticipated (USDA APHIS, 2015). Indirect risk to reptiles from the loss of food items is expected to be low due to the low application rates and implementation of preferred program measures such as RAATs (USDA APHIS, 2018d).

The risk to aquatic vertebrates and invertebrates is low for most species; however, some sensitive species that occur in shallow water habitats may be at risk. Program measures such application buffer zones, drift mitigation measures and the use of RAATs will reduce these risks.

Risks to terrestrial invertebrate populations are anticipated based on the available toxicity data for invertebrates and the broad spectrum activity of malathion (Swain, 1986; Quinn et al., 1991). The risk to terrestrial invertebrates can be reduced by the implementation of application buffers and the use of RAATs, which would reduce exposure and create refuge areas where malathion impacts would be reduced or eliminated. Smith et al. (2006) conducted field studies to evaluate the impacts of grasshopper treatments to non-target terrestrial invertebrates and found minimal impacts when making reduced rate applications with a reduced coverage area (i.e. RAATs) for a ULV end-use product of malathion. Impacts to pollinators have the potential to be significant, based on available toxicity data for honeybees that demonstrate high contact toxicity from malathion exposures (USDA APHIS, 2018d). However, risk to pollinators is reduced because of the short residual toxicity of malathion. In addition, the incorporation of other mitigation measures in the program, such as the use of RAATs and wind speed and direction mitigations that are designed to minimize exposure, reduce the potential for population-level impacts to terrestrial invertebrates.

Adverse human health effects from ULV applications of malathion to control grasshopper are not expected based on the low mammalian acute toxicity of malathion and low potential for human exposure. Malathion inhibits AChE in the central and peripheral nervous system with clinical signs of neurotoxicity that include tremors, salivation, urogenital staining, and decreased motor activity. USEPA indicates that malathion has “suggestive evidence of carcinogenicity but not sufficient to assess human carcinogenic potential” (USEPA, 2016c).

Adverse health risks to program workers and the general public from malathion exposure are also not expected due to low potential for exposure. APHIS treatments are conducted in rangeland areas consisting of widely scattered, single, rural dwellings in ranching communities, where agriculture is a primary industry. Label requirements to reduce exposure include minimizing spray drift, avoidance of water bodies and restricted entry interval. Program measures such as applying malathion once per season, lower application rates, application buffers and other measures further reduce the potential for exposure to the public.

### d) Reduced Area Agent Treatments (RAATs)

The use of RAATS is the most common application method for all program insecticides and would continue to be so, accept in rare pest conditions that warrant full coverage and higher rates. The goal of the RAATs strategy is to suppress grasshopper populations to a desired level, rather than to reduce those populations to the greatest possible extent. This strategy has both economic and environmental benefits. APHIS would apply a single application of insecticide per year, typically using a RAATs strategy that decreases the rate of insecticide applied by either using lower insecticide spray concentrations, or by alternating one or more treatment swaths. Usually RAATs applications use both lower concentrations and skip treatment swaths. The RAATs strategy suppresses grasshoppers within treated swaths, while conserving grasshopper predators and parasites in swaths that are not treated.

The concept of reducing the treatment area of insecticides while also applying less insecticide per treated acre was developed in 1995, with the first field tests of RAATs in Wyoming (Lockwood and Schell, 1997). Applications can be made either aerially or with ground-based equipment (Deneke and Keyser, 2011). Studies using the RAATs strategy have shown good control (up to 85% of that achieved with a total area insecticide application) at a significantly lower cost and less insecticide, and with a markedly higher abundance of non-target organisms following application (Lockwood et al., 2000; Deneke and Keyser, 2011). Levels of control may also depend on variables such as body size of targeted grasshoppers, growth rate of forage, and the amount of coverage obtained by the spray applications (Deneke and Keyser, 2011). Control rates may also be augmented by the necrophilic and necrophagic behavior of grasshoppers, in which grasshoppers are attracted to volatile fatty acids emanating from cadavers of dead grasshoppers and move into treated swaths to cannibalize cadavers (Lockwood et al., 2002; Smith and Lockwood, 2003). Under optimal conditions, RAATs decrease control costs, as well as host plant losses and environmental effects (Lockwood et al., 2000; Lockwood et al., 2002).

The efficacy of a RAATs strategy in reducing grasshoppers is, therefore, less than conventional treatments and more variable. Foster et al. (2000) reported that grasshopper mortality using RAATs was reduced 2 to 15% from conventional treatments, depending on the insecticide, while Lockwood et al. (2000) reported 0 to 26% difference in mortality between conventional and RAATs methods. APHIS will consider the effects of not suppressing grasshoppers to the greatest extent possible as part of the treatment planning process.

RAATs reduces treatment costs and conserves non-target biological resources in untreated areas. The potential economic advantages of RAATs was proposed by Larsen and Foster (1996), and empirically demonstrated by Lockwood and Schell (1997). Widespread efforts to communicate the advantages of RAATs across the Western States were undertaken in 1998 and have continued on an annual basis. The viability of RAATs at an operational scale was initially demonstrated by Lockwood et al. (2000), and subsequently confirmed by Foster et al. (2000). The first government agencies to adopt RAATs in their grasshopper suppression programs were the Platte and Goshen County Weed and Pest Districts in Wyoming; they also funded research at the University of Wyoming to support the initial studies in 1995. This method is now commonly used by government agencies and private landowners in States where grasshopper control is required.

Reduced rates should prove beneficial for the environment. All APHIS grasshopper treatments using carbaryl, diflubenzuron, or malathion are conducted in adherence with USEPA-approved label directions. Labeled application rates for grasshopper control tend to be lower than rates used against other pests. In addition, use rates proposed for grasshopper control by APHIS are lower than rates used by private landowners.

## 3. Research Treatments Alternative

### a) Research *Metarhizium robertsii* Applications

*Metarhizium* is a common entomopathogenic fungus genus containing several species, all of which are host-restricted to the Arthropoda, with some having greater host specificity to an insect family, or even a group of related genera. Once considered a single species based on morphology but split into a number of species based on DNA sequence data, the genus is found worldwide and is commonly used as a management alternative to chemicals (USDA, 2000; Lomer et al., 2001; Zimmerman, 2007; Roberts, 2018; Zhang et al. 2019). Two *Metarhizium*, *M. brunneum* strain F52 and *M. anisopliae* ESF1, are registered with the USEPA as insecticides and are commercially used against a range of pest insects.

No harm is expected to humans from exposure to *Metarhizium* by ingesting, inhaling, or touching products containing this active ingredient. No toxicity or adverse effects were seen when the active ingredient was tested in laboratory animals. *M. anisopliae* has undergone extensive toxicology testing for its registration in Africa and the registration of Green Guard in Australia. There has been no demonstrated adverse effect on humans from these products. There is a potential for an allergic reaction to dry conidia if a person is extensively exposed to the product and has a preexisting allergy to fungal spores. *Metarhizium* use in this program is not expected to cause adverse impacts to soil, water, or air. No adverse impacts from the use of *Metarhizium* biopesticides have been observed in almost 20 years of field trials in other countries.

From 2005 to 2017, a massive project (led by Donald W. Roberts, Utah State University, in collaboration with USDA and others, and funded by APHIS PPQ S&T) was undertaken to collect 38,052 soil samples from across the 17 western states, from areas that were historically known to have large populations of grasshoppers and/or Mormon crickets. The purpose of these collections was to locate a domestic alternative to the nonindigenous *M. acridum*, used around the world for management of grasshopper (usually locust) populations, particularly in Australia and sub-Sahelian Africa, but also in Mexico and Brazil. The use of such a pathogen would be highly useful to the Program as a biopesticide. Approximately 2,400 new isolates of *Metarhizium* spp., *Beauveria spp*. and other entomopathogenic fungi were found. Many of these fungi isolates were selected for lab and field trials with grasshoppers and Mormon crickets, the most promising being strain DWR2009 belonging to the species *M. robertsii* (Bischoff et al., 2009). The DWR2009 isolate is still undergoing lab and field testing for efficacy against orthopterans. This species is closely related to *M. anisopliae*, which is commonly found worldwide and discernible only on the basis of diagnostic DNA sequences (Roberts, 2018).

There is the potential for prolonged persistence in the environment of a domestic isolate from one area brought to another. Despite this possibility, potential environmental impact is minimal given the widespread and common nature of *Metarhizium* in the western United States and because the DWR2009 isolate have been chosen for their optimized effects on orthopterans (Roberts, 2018). Although entomopathogenic fungi can reduce grasshopper populations, a substantial portion of the treated population are able to resist the infection through thermoregulation. Molecular systematics analyses (by the Roberts Lab; Bischoff et al., 2009; Kepler et al., 2014; Mayerhofer et al., 2019) revealed DWR2009 is very closely related to many other strains within *M. robertsii*, all of which are basically biologically equivalent to each other. In fact, *Metarhizium robertsii* can only be really differentiated from other species by a multiplexed PCR assay based on two gene sequences. Furthermore, it is likely that persistence effects would mirror those found to be the case for *M. anisopliae* and *M. acridum*. Both of these species need optimal temperature ranges to thrive, as well as relatively humid conditions (Zimmerman, 2007; EA, 2010). In particular, *M. acridum* does not persist in semi-arid and arid environments, which is what rangeland habitats are, where U.S. grasshopper outbreaks occur (EA, 2010). If the DWR2009 strain derived biopesticide is spread outside of the research plots exceptional rates of fungal infection are not anticipated. Since *M. anisopliae* is a generalist entomopathogen, lethal effects on non-target arthropods have been reported, but are more commonly observed in laboratory experiments than in the field. Plus, such effects are dependent on how the pathogen is applied; i.e., its intended target and application method play roles in non-target effects (Zimmerman, 2007). During research experiments, the Rangeland Unit will spray ultra-low volumes (on 10 acres or less) of DWR2009 on grasshopper and Mormon cricket species from aircraft, or through the FAASSTT system. The Rangeland Unit may also coat small amounts of grasshopper bait with the DWR2009.

For the following four reasons, overall environmental impact by research studies utilizing *Metarhizium robertsii* applications should not be significant: 1) various strains of the pathogen are already common in rangeland habitats; 2) “behavioral fever” enables species to often “burn out” the infection by basking, allowing infected grasshoppers and Mormon crickets to escape death by mycosis; 3) fungal pathogens are fairly susceptible to heat and ultraviolet light, greatly reducing the environmental persistence of spores to a few days on treated foliage or ground; and 4) at least three days of 98-100% relative humidity is required for fungal outgrowth and sporulation (reproduction) from infected cadavers (Lomer et al., 2001; Zimmerman, 2007; EA, 2010; Roberts, 2018).

### b) Research LinOilEx Applications

LinOilEx (Formulation 103) is a non-traditional pesticide alternative still in the early stages of development. Its mode of action appears to be topical, often inducing a “freezing” effect in treated specimens whereby they appear to have been mid-movement when they die. Previous studies by its creator using locusts and katydids showed promise in its efficacy (Abdelatti and Hartbauer, 2019), so the Rangeland Unit decided to test it. Initial Mormon cricket microplot field studies and grasshopper lab studies are intriguing and warrant further field investigations via microplot cage research experiments. The formulation is proprietary, but includes linseed oil, lecithin, wintergreen oil, and caraway oil mixed into a bicarbonate emulsion.

Target effects on locusts and katydids in initial studies were high while non-target results were mixed, with one tested beetle species, as well as wheat seedlings, experiencing almost no impact. Another tested beetle species did experience relatively high mortality, but well-below target levels (Abdelatti and Hartbauer, 2019). The mode of action appears to be topical, meaning that direct contact with the formulation is needed to induce mortality. The Rangeland Unit's initial studies demonstrated that indirect contact, by spraying vegetation, did not induce mortality. Together, these data suggest that overall environmental impact by research studies utilizing LinOilEx applications is expected to be relatively minimal.

## *B. Other Environmental Considerations*

### 1. Cumulative Impacts

Cumulative impact, as defined in the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 CFR § 1508.7) "is the impact on the environment which results from the incremental impact of the action when added to the past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Potential cumulative impacts associated with the No Action alternative where APHIS would not take part in any grasshopper suppression program include the continued increase in grasshopper populations and potential expansion of populations into neighboring range and cropland. In addition, State and private land managers could apply insecticides to manage grasshopper populations however, land managers may opt not to use RAATs, which would increase insecticides applied to the rangeland. Increased insecticide applications from the lack of coordination or foregoing RAATs methods could increase the exposure risk to non-target species. In addition, land managers may not employ the extra program measures designed to reduce exposure to the public and the environment to insecticides.

Potential cumulative impacts associated with the Preferred Alternative are expected to be minimal because the program applies an insecticide application once during a treatment. The program may treat an area with different insecticides but does not overlap the treatments. The program does not mix or combine insecticides. Based on historical outbreaks in the United States, the probability of an outbreak occurring in the same area where treatment occurred in the previous year is unlikely; however, given time, populations eventually will reach economically damaging thresholds and require treatment. The insecticide application reduces the insect population down to levels that cause an acceptable level of economic damage. The duration of treatment activity, which is relatively short since it is a one-time application, and the lack of repeated treatments in the same area in the same year reduce the possibility of significant cumulative impacts.

Potential cumulative impacts resulting from the use of insecticides include insect pest resistance, synergistic chemical effects, chemical persistence and bioaccumulation in the environment. The program use of reduced insecticide application rates (i.e. ULV and RAATs) are expected to mitigate the development of insect resistance to the insecticides. Grasshopper outbreaks in the United States occur cyclically so applications do not occur to the same population over time further eliminating the selection pressure increasing the chances of insecticide resistance.

The insecticides proposed for use in the program have a variety of agricultural and non-agricultural uses. There may be an increased use of these insecticides in an area under suppression when private, State, or Federal entities make applications to control other pests. However, the vast majority of the land where program treatments occur is uncultivated rangeland and additional treatments by landowners or managers are very uncommon making possible cumulative or synergistic chemical effects extremely unlikely.

The insecticides proposed for use in the grasshopper program are not anticipated to persist in the environment or bioaccumulate. Therefore, a grasshopper outbreak that occurs in an area previously treated for grasshoppers is unlikely to cause an accumulation of insecticides from previous program treatments.

The proposed experimental treatments are short-term and would take place in a very limited area. The purpose of the field tests conducted by the Rangeland Unit will help determine whether APHIS would eventually include the following as options for the Program: 1) the use of UAS to aerially apply Program insecticides, 2) the use of the biopesticide *Metarhizium robertsii* (isolate DWR2009), and 3) the use of the non-traditional insecticide LinOilEx. The data generated by these studies would likely be used as part of the EPA registration process for this biopesticide. Inclusion of effective and environmentally friendly insecticides would provide the Program additional control options for grasshoppers and Mormon crickets in sensitive habitats. If successful, the use of *M. robertsii* could decrease the amount of chemical insecticides used in rangeland against grasshoppers and Mormon crickets.

## 2. Endangered Species Act

Under the Endangered Species Act of 1973, Section 7, federal agencies are required to consult with the USFWS regarding the degree of impact to federally proposed and listed species and critical habitat from the program action and the necessary protective measures to avoid or minimize adverse effects. Informal consultation between APHIS and the USFWS may be used to determine whether any adverse effects to species or habitat by the proposed action can be avoided or summarily minimized.

The last formal consultation resulted in the 1998 biological assessment prepared by APHIS and the 1995 biological opinion issued by USFWS. This environmental assessment uses information from past formal consultations in determining protective measures.

Carbaryl and malathion have been included in consultation procedures in the past. The 1995 biological opinion has summarized the language from former assessments and opinions on the effects of both pesticides:

**Carbaryl:**

In general, carbaryl demonstrates low to moderate mammalian toxicity, low toxicity to birds, and moderate toxicity to fish. It is very toxic to aquatic invertebrates and many terrestrial insects. Carbaryl remains effective on vegetation for approximately seven days and 28 days in anaerobic soils (U.S. Fish and Wildlife Service, 1995).

**Diflubenzuron:**

Further information on carbaryl, diflubenzuron, and malathion are included earlier in this EA, in the 2002 EIS and in the 2019 EIS.

Due to the incomplete formal consultation, local informal consultations have been completed. Correspondence regarding local consultations between APHIS and USFWS are included in Appendix 2 "USFWS/NMFS/WGFD Correspondence".

**Malathion:**

Malathion is relatively low in toxicity to mammals and birds. It is moderately to highly toxic to fish and amphibians. Malathion is extremely toxic to aquatic invertebrates and highly toxic to most insects, including bees. Malathion is relatively non-persistent in soil, water, plants, and animals. Its half-life in alkaline soils is generally less than one day; in water, the half-life is generally less than two days. Malathion residues in plants persist up to five to seven days. Malathion does not bioaccumulate in animals; it is rapidly excreted after exposure ceases (U.S. Fish and Wildlife Service, 1995).

## 3. Monitoring

Monitoring involves the evaluation of various aspects of the grasshopper suppression programs. There are three aspects of the programs that may be monitored. The first is the efficacy of the treatment. APHIS will determine how effective the application of an insecticide has been in suppressing the grasshopper population within a treatment area and will report the results in a Work Achievement Report to the Western Region. Work achievement reports are available from the Cheyenne, Wyoming USDA APHIS PPQ office for specific spray blocks upon request. No treatments were conducted in 2012, 2013, 2014, 2015, 2016, 2017 or 2018 by PPQ in Wyoming.

The second area included in monitoring is safety. This includes ensuring the safety of the program personnel through medical monitoring conducted specifically to determine risks of a hazardous material. The cholinesterase health monitoring program is mandatory and prevents and/or reduces overexposure to cholinesterase inhibiting compounds such as carbamate and organophosphate pesticides. Since the effect of these pesticides is cumulative during a period of exposure, it is mandatory that all exposed individuals be monitored. The APHIS cholinesterase monitoring program will help protect employees from pesticide poisoning and will also help monitor the use and condition of personal protective equipment. APHIS program personnel are also provided proper hearing protection equipment. Chemical application equipment such as planes, trucks and sprayer motors may affect hearing if exposed for long periods of time. (See APHIS

Safety and Health Manual, USDA APHIS, 1998 located online at https://www.aphis.usda.gov/aphis/resources/manualsandguidelines)

The third area of monitoring is environmental monitoring. APHIS Directive 5640.1 commits APHIS to a policy of monitoring the effects of Federal programs on the environment. Environmental monitoring includes such activities as checking to make sure the insecticides are applied in accordance with the labels, and that sensitive sites and organisms are protected. The environmental monitoring recommended for grasshopper suppression programs involves monitoring sensitive sites such as bodies of water used for human consumption or recreation or which have wildlife value, habitats of endangered and threatened species, habitats of other sensitive wildlife species, edible crops, and any sites for which the public has expressed concern or where humans might congregate (e.g. schools, parks, hospitals).

The current environmental monitoring plan can be found at https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/sa_emt/ct_support_docs. Past years environmental monitoring reports are available upon request from the Cheyenne, Wyoming USDA APHIS PPQ office.

Treatments conducted by PPQ in 2010 amounted to 1,027,099 protected acres. All treatments in 2010 were conducted using Dimilin 2L and RAATs methodology.

Treatments conducted by PPQ in 2011 amounted to 81,527 protected acres. All treatments in 2011 were conducted using Dimilin 2L and RAATs methodology.

No treatments were conducted by PPQ in Wyoming during 2012, 2013, 2014, 2015, 2016, 2017 and 2018.

Treatments conducted by PPQ in 2019 amounted to 130,902 protected acres. All treatments in 2019 were conducted using Dimilin 2L and RAATs methodology.

### 4. Fires and Human Health Hazards

Various compounds are released in smoke during wildland fires, including carbon monoxide (CO), carbon dioxide, nitrous oxides, sulfur dioxide, hydrogen chloride, aerosols, polynuclear aromatic hydrocarbons contained within fine particulate matter (a byproduct of the combustion of organic matter such as wood), aldehydes, and most notably formaldehyde produced from the incomplete combustion of burning biomass (Reisen and Brown, 2009; Burling et al., 2010; Broyles, 2013). Particulate matter, CO, benzene, acrolein, and formaldehyde have been identified as compounds of particular concern in wildland fire smoke (Reinhardt and Ottmar, 2004).

Many of the naturally occurring products associated with combustion from wildfires may also be present as a result of combustion of program insecticides that are applied to rangeland. These combustion byproducts will be at lower quantities due to the short half-lives of most of the program insecticides and their low use rates. Other minor combustion products specific to each insecticide may also be present as a result of combustion from a rangeland fire but these are typically less toxic based on available human health data (http://www.aphis.usda.gov/plant-health/grasshopper).

The safety data sheet for each insecticide identifies these combustion products for each insecticide as well as recommendations for PPE. The PPE is similar to what typically is used in fighting wildfires. Material applied in the field will be at a much lower concentration than what would occur in a fire involving a concentrated formulation. Therefore, the PPE worn by rangeland firefighters would also be protective of any additional exposure resulting from the burning of residual insecticides.

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# VI. Listing of Agencies and Persons Consulted

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# Appendix 1: APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program FY-2021 Treatment Guidelines

Version 2/5/2021

The objectives of the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program are to 1) conduct surveys in the Western States; 2) provide technical assistance to land managers and private landowners; and 3) when funds permit, suppress economically damaging grasshopper and Mormon cricket outbreaks on Federal, Tribal, State, and/or private rangeland. The Plant Protection Act of 2000 provides APHIS the authority to take these actions.

## General Guidelines for Grasshopper / Mormon Cricket Treatments

1. All treatments must be in accordance with:
    a. the Plant Protection Act of 2000;
    b. applicable environmental laws and policies such as: the National Environmental Policy Act, the Endangered Species Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Clean Water Act (including National Pollutant Discharge Elimination System requirements – if applicable);
    c. applicable state laws;
    d. APHIS Directives pertaining to the proposed action;
    e. Memoranda of Understanding with other Federal agencies.

2. Subject to the availability of funds, upon request of the administering agency, the agriculture department of an affected State, or private landowners, APHIS, to protect rangeland, shall immediately treat Federal, Tribal, State, or private lands that are infested with grasshoppers or Mormon crickets at levels of economic infestation, unless APHIS determines that delaying treatment will not cause greater economic damage to adjacent owners of rangeland. In carrying out this section, APHIS shall work in conjunction with other Federal, State, Tribal, and private prevention, control, or suppression efforts to protect rangeland.

3. Prior to the treatment season, conduct meetings or provide guidance that allows for public participation in the decision-making process. In addition, notify Federal, State and Tribal land managers and private landowners of the potential for grasshopper and Mormon cricket outbreaks on their lands. Request that the land manager / landowner advise APHIS of any sensitive sites that may exist in the proposed treatment areas.

4. Consultation with local Tribal representatives will take place prior to treatment programs to fully inform the Tribes of possible actions APHIS may take on Tribal lands.

5. On APHIS run suppression programs, the Federal government will bear the cost of treatment up to 100% on Federal and Tribal Trust land, 50% of the cost on State land, and 33% of cost on private land. There is an additional 16.15% charge, however, on any funds received by APHIS for federal involvement with suppression treatments.

6. Land managers are responsible for the overall management of rangeland under their control to prevent or reduce the severity of grasshopper and Mormon cricket outbreaks. Land managers are encouraged to have implemented Integrated Pest Management Systems prior to requesting a treatment. In the absence of available funding or in the place of APHIS funding, the Federal land management agency, Tribal authority or other party/ies may opt to reimburse APHIS for suppression treatments. Interagency agreements or reimbursement agreements must be completed prior to the start of treatments which will be charged thereto.

7. There are situations where APHIS may be requested to treat rangeland that also includes small areas where crops are being grown (typically less than 10% of the treatment area). In those situations, the crop owner pays the entire treatment costs on the croplands.

NOTE: The insecticide being considered must be labeled for the included crop as well as rangeland and current Worker Protection Standards must be followed by the applicator and private landowner.

8. In some cases, rangeland treatments may be conducted by other federal agencies (e.g., Forest Service, Bureau of Land Management, or Bureau of Indian Affairs) or by non-federal entities (e.g., Grazing Association or County Pest District). APHIS may choose to assist these groups in a variety of ways, such as:
    a. loaning equipment (an agreement may be required):
    b. contributing in-kind services such as surveys to determine insect species, instars, and infestation levels;
    c. monitoring for effectiveness of the treatment;
    d. providing technical guidance.

9. In areas considered for treatment, State-registered beekeepers and organic producers shall be notified in advance of proposed treatments. If necessary, non-treated buffer zones can be established.

**<u>Operational Procedures</u>**

***GENERAL PROCEDURES FOR ALL AERIAL AND GROUND APPLICATIONS***

1. Follow all applicable Federal, Tribal, State, and local laws and regulations in conducting grasshopper and Mormon cricket suppression treatments.

2. Notify residents within treatment areas, or their designated representatives, prior to proposed operations. Advise them of the control method to be used, proposed method of application, and precautions to be taken.

3. One of the following insecticides that are labeled for rangeland use can be used for a suppression treatment of grasshoppers and Mormon crickets:
    A. Carbaryl
        a. solid bait

        b. ultra-low volume (ULV) spray
    B. Diflubenzuron ULV spray
    C. Malathion ULV spray

4. Do not apply insecticides directly to water bodies (defined herein as reservoirs, lakes, ponds, pools left by seasonal streams, springs, wetlands, and perennial streams and rivers).

   Furthermore, provide the following buffers for water bodies:
   - 500-foot buffer with aerial liquid insecticide.
   - 200-foot buffer with ground liquid insecticide.
   - 200-foot buffer with aerial bait.
   - 50-foot buffer with ground bait.

5. Instruct program personnel in the safe use of equipment, materials, and procedures; supervise to ensure safety procedures are properly followed.

6. Conduct mixing, loading, and unloading in an approved area where an accidental spill would not contaminate a water body.

7. Each aerial suppression program will have a Contracting Officer's Representative (COR) OR a Treatment Manager on site. Each State will have at least one COR available to assist the Contracting Officer (CO) in GH/MC aerial suppression programs.

   NOTE: A Treatment Manager is an individual that the COR has delegated authority to oversee the actual suppression treatment; someone who is on the treatment site and overseeing / coordinating the treatment and communicating with the COR. No specific training is required, but knowledge of the Aerial Application Manual and treatment experience is critical; attendance to the Aerial Applicators Workshop is very beneficial.

8. Each suppression program will conduct environmental monitoring as outlined in the current year's Environmental Monitoring Plan.

   APHIS will assess and monitor rangeland treatments for the efficacy of the treatment, to verify that a suppression treatment program has properly been implemented, and to assure that any environmentally sensitive sites are protected.

9. APHIS reporting requirements associated with grasshopper / Mormon cricket suppression treatments can be found in the APHIS Grasshopper Program Guidebook: http://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/grasshopper.pdf

***SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS***

1. APHIS Aerial treatment contracts will adhere to the current year's Statement of Work (SOW).

a. Rain is falling or is imminent;
b. Dew is present over large areas within the treatment block;
c. There is air turbulence that could affect the spray deposition;
d. Temperature inversions (ground temperature higher than air temperature) develop and deposition onto the ground is affected.

2. Weather conditions will be monitored and documented during application and treatment will be suspended when conditions could jeopardize the correct spray placement or pilot safety.

3. Application aircraft will fly at a median altitude of 1 to 1.5 times the wingspan of the aircraft whenever possible or as specified by the COR or the Treatment Manager.

Whenever possible, plan aerial ferrying and turnaround routes to avoid flights over congested areas, water bodies, and other sensitive areas that are not to be treated.

# Appendix 2: USFWS/NMFS/WGFD Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE
334 Parsley Boulevard
Cheyenne, Wyoming 82007

In Reply Refer to:
FWS/IR05/IR07

In Reply Refer To:
06E13000-2021-I-0128

March 12, 2021

Kathleen Meyers
U.S. Department of Agriculture
Animal and Plant Health Inspection Service
5353 Yellowstone Road, Suite 208
Cheyenne, Wyoming 82009

Dear Ms. Meyers:

This letter is in response to your correspondence dated March 3, 2021, with attached Draft Environmental Assessment (EA) plus appendices requesting initiation of section 7 consultation pursuant to section 7(a)(2) of the Endangered Species Act of 1973 (ESA), as amended, 50 CFR 402.13, for potential effects to listed species from the Animal and Plant Health Inspection Service (APHIS) Rangeland Grasshopper and Mormon Cricket Suppression Program. Activities associated with this program are scheduled to occur from March 1 to September 31 of 2021 in Wyoming. It is our understanding that the first choice for chemicals to be used will be diflubenzuron, known by the tradename as Dimilin®, using the Reduced Agent Area Treatment (RAAT) method. If additional chemicals are needed to control outbreaks, APHIS has the option of adding carbaryl or malathion as necessitated by the scope and timing of grasshopper or Mormon cricket population levels.

Based on the project description presented in the EA and the impact analysis presented in Appendix 3, the U.S. Fish and Wildlife Service (Service) concurs with your determinations that the APHIS grasshopper and Mormon cricket suppression program of 2021 may affect but is not likely to adversely affect the yellow-billed cuckoo (*Coccyzus americanus*). Regarding the occupied habitat of the yellow-billed cuckoo, APHIS has also committed to implementing (1) a 500-foot ground buffer and a 750-foot aerial buffer for the use of carbaryl bait; (2) a 500-foot ground buffer and 1,000-foot aerial buffer for the use of diflubenzuron ULV; and (3) a 500-foot ground and 1,320-foot aerial buffer for malathion at the edge of known locations of the yellow-billed cuckoo or their suitable habitat.

The Service concurs with your determination that the suppression program, as described, may affect but is not likely to adversely affect the northern long-eared bat (*Myotis septentrionalis*) (NLEB). APHIS grasshopper and Mormon cricket suppression efforts are not anticipated to occur in the interior forest habitats typical of this species. Furthermore, program applications will use the RAAT methodologies so that adequate prey is expected to remain, will not occur during peak foraging periods, and are not expected to contaminate prey or water sources of the NLEB. If APHIS determines that project activities will occur in close proximity to the forested habitat of northeast Wyoming or in areas occupied by the

NLEB, then APHIS will reinitiate consultation at the project-specific level prior to project implementation.

The Service also concurs with your determination that the project, as described, is not likely to adversely affect the Kendall warm springs dace (*Rhinichthys osculus thermalis*) as no suppression activities will occur in the vicinity of this fish. In the event that suppression activities will occur in Sublette County, APHIS has committed to implementing a 0.25-mile buffer around the Kendall Warm Springs site for all chemicals used and ground applications of malathion. If malathion will be applied aerially, then a 1-mile buffer will be maintained.

The Service concurs with your determination that grasshopper suppression activities are not likely to adversely affect the Preble's meadow jumping mouse (*Zapus hudsonius preblei*), because such activities are unlikely to occur in areas of the mouse's preferred habitat. Additionally, a programmatic 500-foot buffer is placed on either side of streams or water bodies, which is standard procedure for all USDA APHIS grasshopper aerial suppression programs. For areas that may be treated using ground equipment the 50 foot buffer will be increased to 500 feet around waters and riparian areas that are Preble's meadow jumping mouse suitable habitat, within the range of the species.

According to the EA, suppression treatments are unlikely to occur in the Shirley Basin area where there is a non-essential experimental population of black-footed ferret (*Mustela nigripes*). The Service concurs with your determination that any treatment activities are not likely to jeopardize the continued existence of the Shirley Basin population as, by definition, any effects to a non-essential, experimental population will not likely jeopardize the continued existence of the species. The Service also concurs that any treatment activities outside the Shirley Basin, with the exception of the recently reintroduced population near Meeteetse in Park County, is not likely to adversely affect this species. Please contact our office if grasshopper suppression activities may occur in Park County.

The Service concurs with your determination that grasshopper suppression activities are not likely to adversely affect the Wyoming toad (*Anaxyrus baxteri*) in the area of the Little Laramie River and Mortenson National Wildlife Refuge as it is unlikely that suppression activities will occur in the vicinity of Mortenson Lake. If suppression activities do occur in Albany County, then a 1-mile buffer for aerial spraying will be maintained on each side of the Little Laramie River and no treatments will be applied within a 1-mile buffer of Mortenson National Wildlife Refuge. Although grasshopper suppression activities are unlikely to occur in Albany County, please contact our office should grasshopper suppression be necessary as there are three safe harbor sites for the Wyoming toad and buffers will need to be implemented.

The Service concurs with your determination that grasshopper suppression activities are not likely to adversely affect the Western glacier stonefly (*Zapada glacier*), because such activities are unlikely to occur in areas of the stonefly's habitat due to a standard 500-foot buffer placed on either side of streams or water bodies, which is standard procedure for all USDA APHIS grasshopper aerial suppression programs. For areas that may be treated using ground equipment the 50 foot buffer will be increased to 500 feet around waters and riparian areas that are Western glacier stonefly suitable habitat, within the range of the species.

The Service also concurs with your not likely to adversely affect determination for Ute ladies'-tresses (*Spiranthes diluvialis*), based on your commitment that should a treatment occur near known occupied habitat after August 1st, APHIS will employ the programmatic 500-foot buffer from water bodies. In addition, the following protective measures will also be implemented: (1) no aerial application of malathion or carbaryl or gamma-cyhalothrin will occur within 3 miles of known occupied habitat; (2) only carbaryl bran bait or diflubenzuron combined with RAATs will be used within a 3-mile buffer; (3)

no application of carbaryl bran bait will be applied within a 0.25-mile buffer of the potential range of the species; and (4) a 50-foot buffer for ground applications will be maintained for all chemicals except diflubenzuron, which has no effect on adult insect pollinators.

The Service also concurs with your not likely to adversely affect determination for blowout penstemon (*Penstemon haydenii*) and desert yellowhead (*Yermo xanthocephalus*), based on your commitment to employ the following protective measures: (1) no aerial application of malathion or carbaryl or gamma-cyhalothrin will occur within 3 miles of known occupied habitat of these plants for the protection of the pollinators; (2) only carbaryl bran bait or diflubenzuron or chlorantraniliprole combined with RAATs will be used within a 3-mile buffer; (3) no application of carbaryl bran bait will be applied within a 0.25-mile buffer of known occupied habitat of these plants; and (4) a 50-foot buffer for ground applications will be maintained for all chemicals except diflubenzuron, which has no effect on adult insect pollinators.

APHIS has determined that the proposed action will have no effect to the Canada lynx (*Lynx canadensis*) or the grizzly bear (*Ursus arctos horribilis*) as treatments are not expected to occur in the montane habitat that these species occupy. APHIS has also determined that there will be no effect to any of the downstream Platte River or downstream Colorado River species as no depletion of water sources will occur and grasshopper suppression activities are not anticipated to affect water quality.

This concludes informal consultation pursuant to the regulations implementing the ESA. This project should be re-analyzed if new information reveals effects of the action that may affect listed or proposed species or designated or proposed critical habitat in a manner or to an extent not considered in this consultation; if the action is subsequently modified in a manner that causes an effect to a listed or proposed species or designated or proposed critical habitat that was not considered in this consultation; and/or, if a new species is listed or critical habitat is designated that may be affected by this project.

The Service requests that any visual observation of threatened and endangered species during suppression activities be reported to our office as soon as possible. We appreciate your efforts to ensure the conservation of endangered, threatened, and candidate species and migratory birds. If you have questions regarding this letter or your responsibilities under the ESA, please contact Kim Dickerson of my staff at the letterhead address or phone (307) 757-3710.

Sincerely,

JOHN HUGHES Digitally signed by JOHN HUGHES Date: 2021.03.12 12:28:13 -07'00' *for*

Tyler A. Abbott
Field Supervisor
Wyoming Field Office

cc: BLM, Endangered Species Program Lead, Cheyenne, WY (C. Keefe) (ckeefe@blm.gov)
WGFD, Statewide Habitat Protection Program, Cheyenne, WY (wgfd.hpp@wyo.gov)

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March 26, 2021

WER 9810.00y
Animal and Plant Health Inspection Service
Draft 2021 Environmental Assessment
Rangeland Grasshopper and Mormon Cricket
Suppression Program

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Dear Ms. King,

The staff of the Wyoming Game and Fish Department (Department) has reviewed the Draft 2021 Environmental Assessment (EA) for the Rangeland Grasshopper and Mormon Cricket Suppression Program. We offer the following comments for your consideration.

In our comments provided April 22, 2020 the Department recommended the following bulleted language be updated in the 2020 EA for the Wyoming Rangeland Grasshopper and Mormon Cricket Suppression Program.

- The State of Wyoming implemented a new Sage-grouse Executive Order (SGEO) in 2019. On page 19, the language should be updated to read, "The Governor's Executive Order 2019-3 specifically lists Grasshopper / Mormon cricket control following Reduced Agent-Area Treatments (RAATS) protocols a de-minimis (exempt) activity under Appendix G, "De-minimis Activities."
- On page 20, the document states that sage-grouse are currently precluded as a federal threatened or endangered species making them a candidate species for listing. Sage-grouse are no longer considered a candidate species by the U.S. Fish and Wildlife Service. In the Wyoming Game and Fish Department 2017 State Wildlife Action Plan (SWAP) sage-grouse are identified as a Tier II Species of Greatest Conservation Need (SGCN). SGCN are placed into one of three tiers: Tier I – highest priority, Tier II – moderate priority, and Tier III – lowest priority. Language in the 2020 EA should be changed to identify sage-grouse as a Tier II SGCN in the State of Wyoming.
- The Wyoming Greater Sage-grouse Conservation Plan (WGSGCP), which was adopted by the State of Wyoming in 2003, has been replaced by the State of Wyoming SGEO. There have been several SGEOs in place since 2008. The Department recommends replacing

language referring to the WGSGCP with language referring to the most current State of Wyoming SGEO.

It appears that the same language should be updated in the 2021 EA to better represent the current federal status of Greater Sage-grouse (sage-grouse), as well as the State of Wyoming and Wyoming Game and Fish Department sage-grouse plans.

Wyoming is currently working to confirm whether the distribution of the northern long-eared bat (NLEB) extends farther south than previously thought. The Department appreciates the Animal and Plant Health Inspection Service's (APHIS) continued coordination and willingness to update information as it becomes available.

The Department recommends that APHIS coordinate with the U.S Fish and Wildlife Service to include language to address impacts and protection for the western bumblebee, Suckley cuckoo bumblebee, and the American bumblebee as these are species that have been petitioned for protection under the Endangered Species Act in the State of Wyoming and may be impacted by pesticide application.

Thank you for the opportunity to comment. If you have any questions or concerns please contact Linda Cope, Habitat Protection Biologist, at 307-777-2533.

Sincerely,

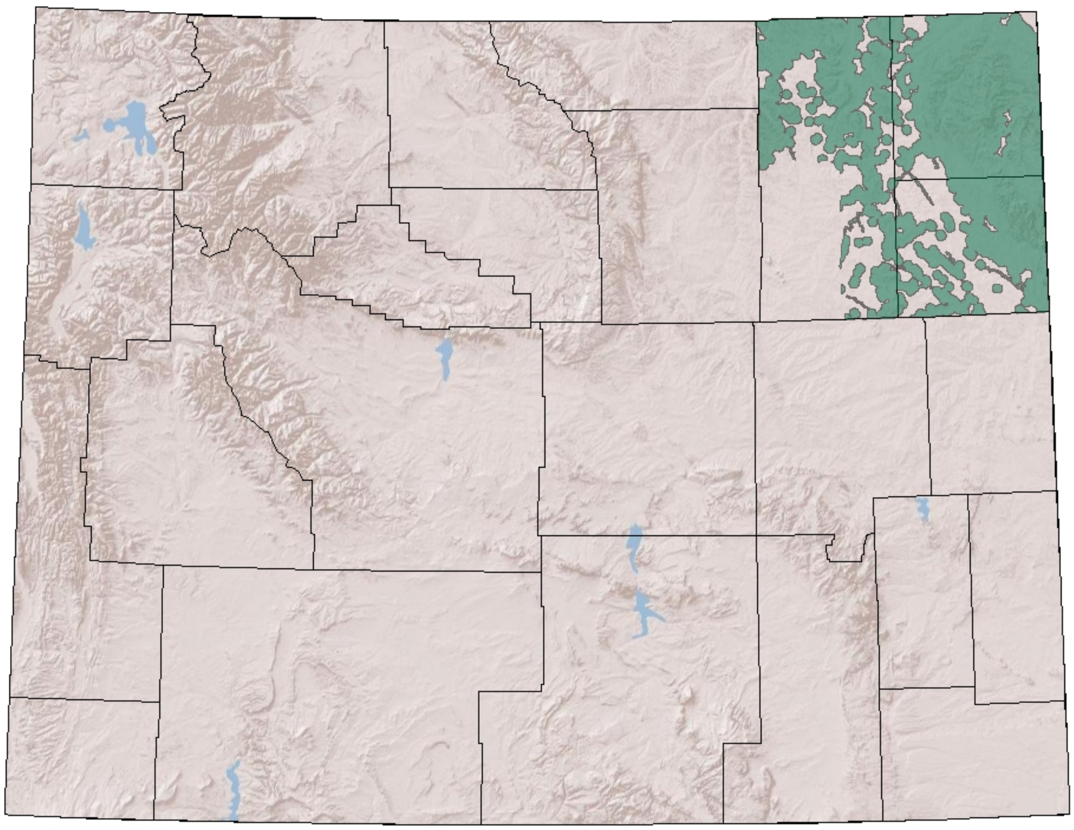
Amanda Losch
Habitat Protection Supervisor

AL/lc/ct

cc: U.S. Fish and Wildlife Service
Leslie Schreiber, Wyoming Game and Fish Department
Zack Walker, Wyoming Game and Fish Department
Chris Wichmann, Wyoming Department of Agriculture

# Appendix 3: Summary of Species Determinations and Impact Mitigation Measures

1. Northern Long-Eared Bat; *Myotis septentrionalis*
    a. Species Status Map



**Myotis septentrionalis**

Northern Long Eared Bat

b. USFWS Status: Threatened with a 4(d) rule

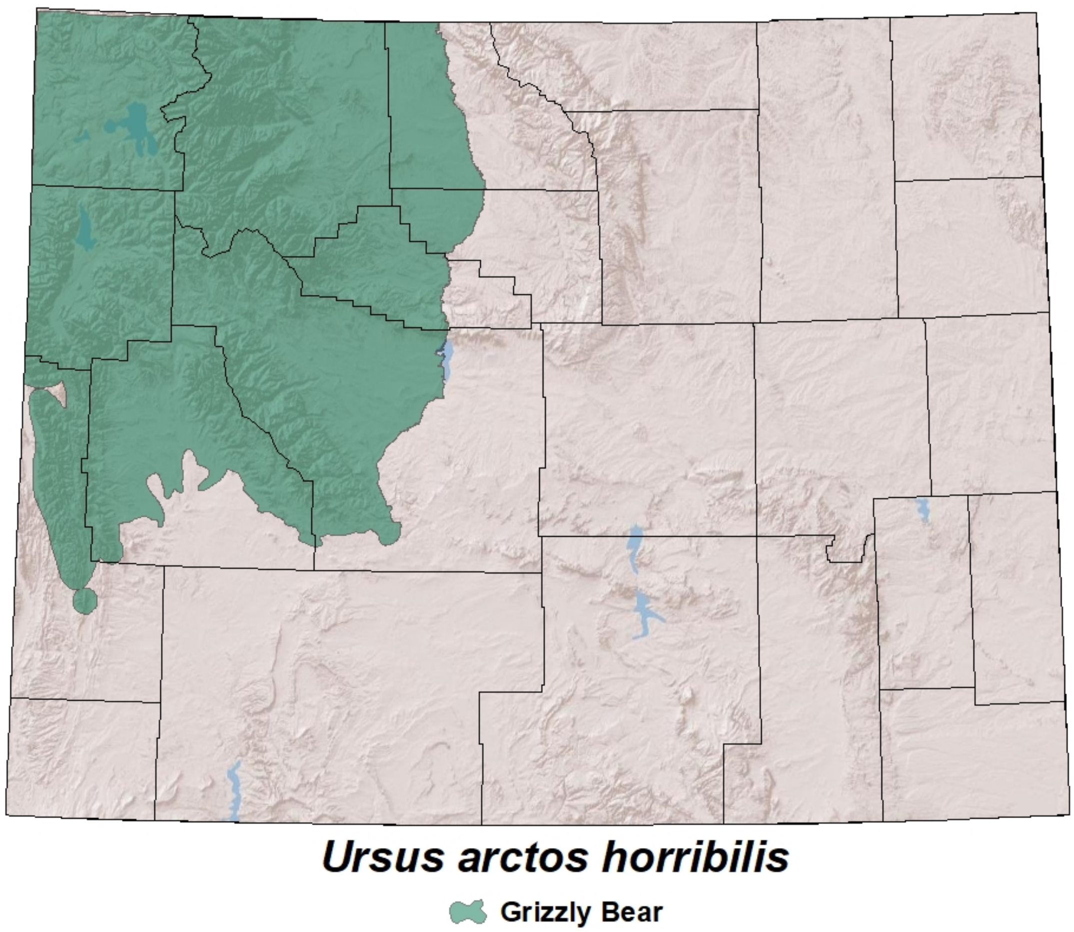
APHIS grasshopper suppression programs may affect but are not likely to adversely affect the Northern Long-Eared Bat.

Wyoming is on the edge of the species range and there are few known active maternity areas in Wyoming. These known locations are all within the Black Hills National Forest of northeastern Wyoming. APHIS would use RAATs methodologies for treatments in most cases and this would be expected to leave adequate prey base for insectivorous species such as the NLEB. The preferred foraging areas for the NLEB are forested areas that would not receive grasshopper or Mormon cricket treatments. In addition, treatments would not occur during peak foraging activity reducing the potential for exposure to program insecticides. Dietary exposure from ingestion of contaminated prey or water is also not anticipated to be a major pathway of exposure for the NLEB. Indirect impacts to the NLEB from loss of invertebrate prey items due to program treatments are not anticipated. There may be insignificant or discountable effects to foraging resources or water due to grasshopper suppression programs outside of (but near to) the NLEB roosting and foraging areas. However, grasshoppers and Mormon crickets are not the typical or primary prey for the NLEB.

Please see Appendix 5 for additional risk summary information.

2. Grizzly bear; *Ursus arctos horribilis*

a. Species Status Map

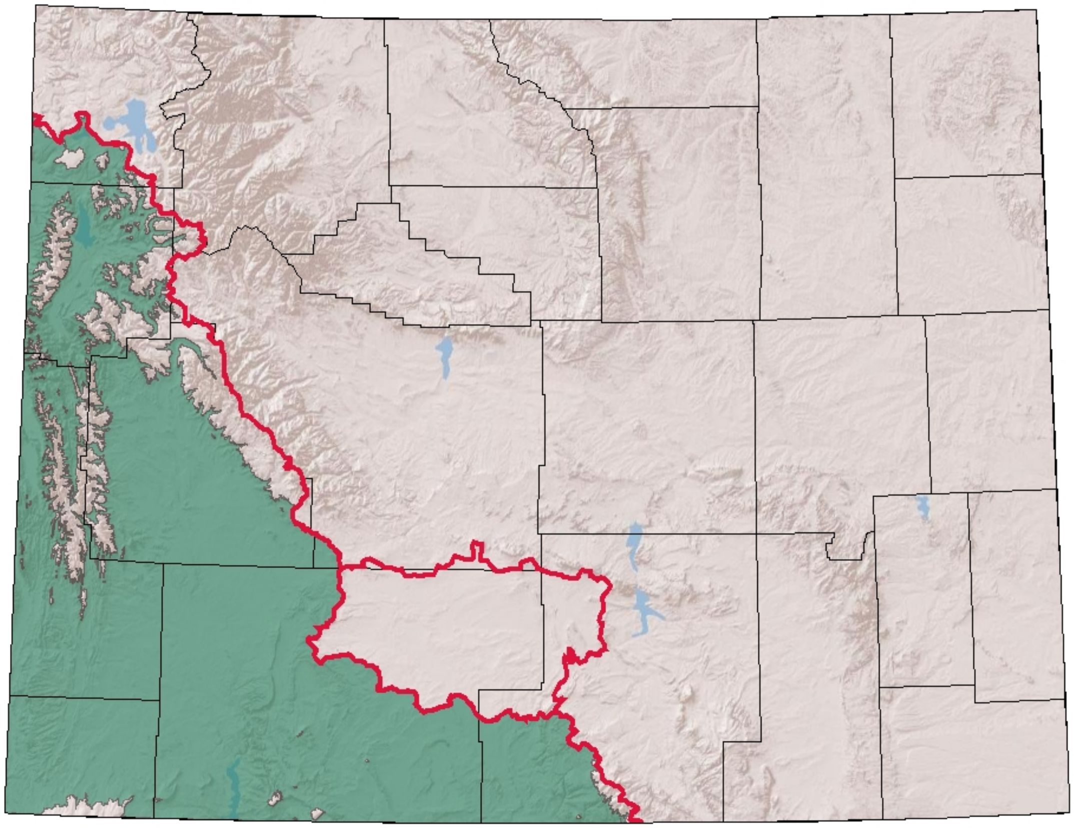



b. USFWS status: Threatened

APHIS grasshopper suppression programs will have no effect on the grizzly bear. It is not likely that APHIS grasshopper suppression programs will occur in areas of the bear's preferred habitat, montane forests. If a suppression program does overlap with the habitat areas of the grizzly bear then a site specific consultation will be initiated with USFWS.

3. Yellow billed Cuckoo; *Coccyzus americanus*

a. Species Status Map




b. USFWS Status: Threatened

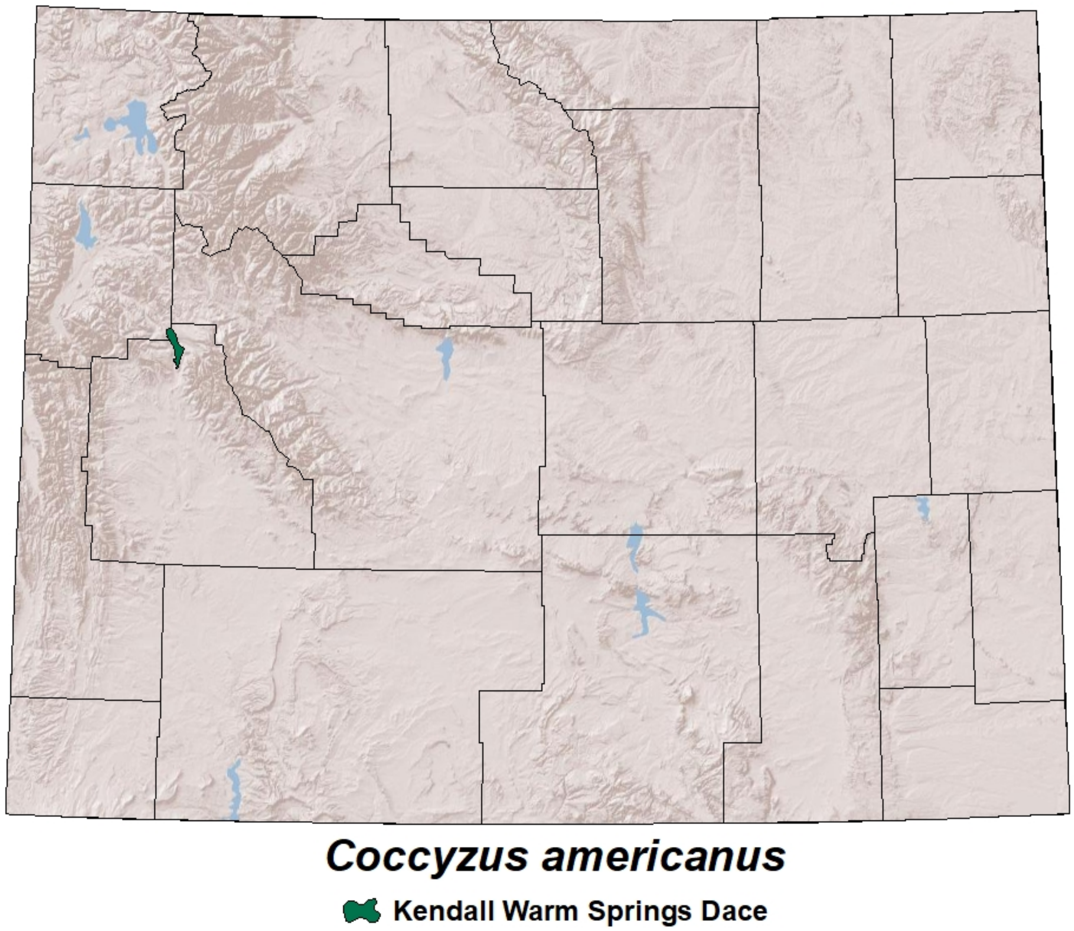
The distinct population segment of the yellow-billed cuckoo west of the Continental Divide is listed under the ESA as a threatened species. Wyoming APHIS grasshopper suppression programs may affect but are not likely to adversely affect the yellow billed cuckoo. The following mitigation measures will be followed:

1. Carbaryl bait: 500 foot ground buffer and 750 foot aerial buffer at the edge of known locations of yellow-billed cuckoos or their suitable habitat.
2. Diflubenzuron: 500 foot ground buffer and 1000 foot aerial buffer at the edge of known locations of yellow-billed cuckoos or their suitable habitat.
3. Carbaryl and malathion ULV: 500 foot ground buffer and 1320 foot aerial buffer at the edge of known locations of yellow-billed cuckoos or their suitable habitat.

Please see Appendix 4 for additional risk summary information.

4. Kendall Warm Springs dace; *Rhinichthys osculus thermalis*

a. Species Status Map

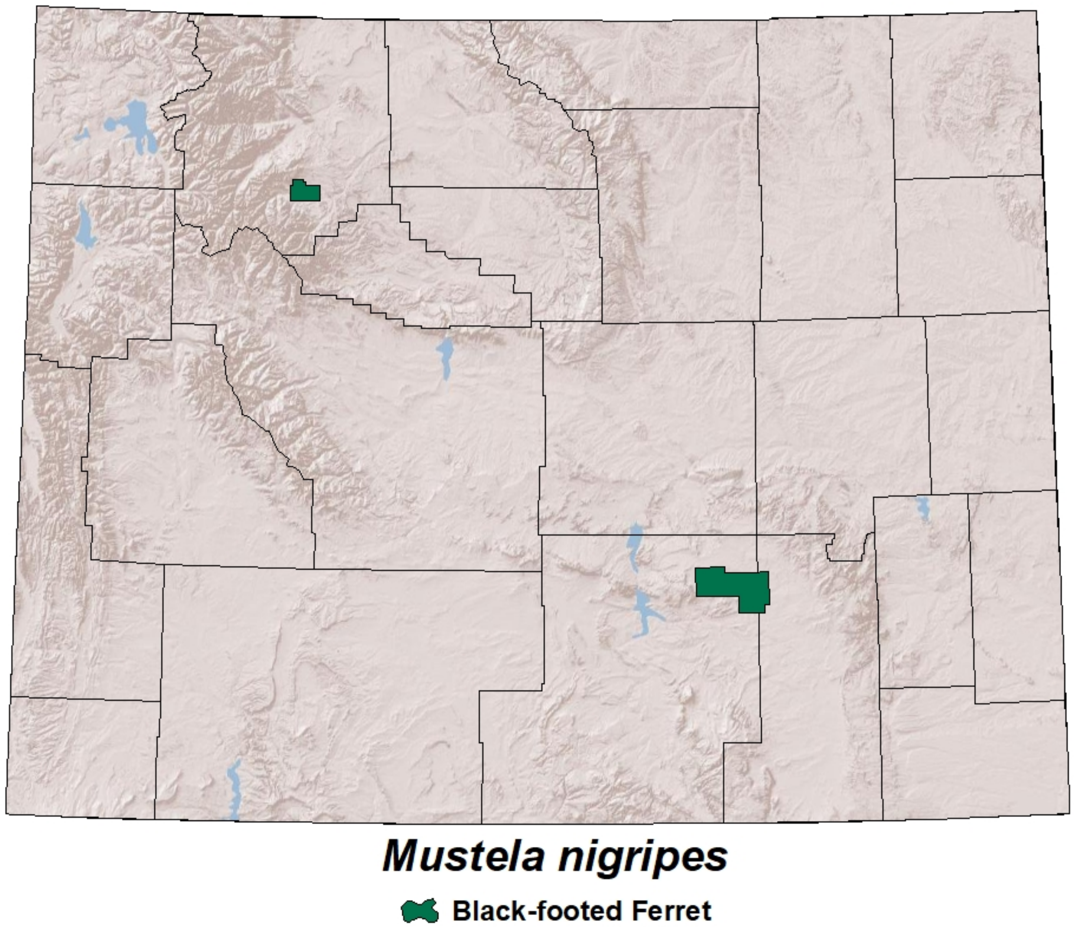



b. USFWS status: Endangered

Grasshopper suppression activities in Wyoming are not likely to adversely affect the Kendall warm springs dace. It is not likely that APHIS grasshopper suppression activities will occur in the vicinity of Kendall warm springs. If suppression activities are conducted in Sublette County then the following impact minimization efforts will be utilized. A 0.25 mile buffer shall be maintained around the Kendall warm springs site for all chemicals, and ground applications of malathion. For aerial applications of malathion, a 1 mile buffer will be maintained.

5. Black-footed ferret; *Mustela nigripes*

a. Species Status Map




b. USFWS status: Endangered

Grasshopper suppression activities in Wyoming are not likely to adversely affect black-footed ferrets. This determination is based on the fact that there are no known non-reintroduced black-footed ferret populations in Wyoming.

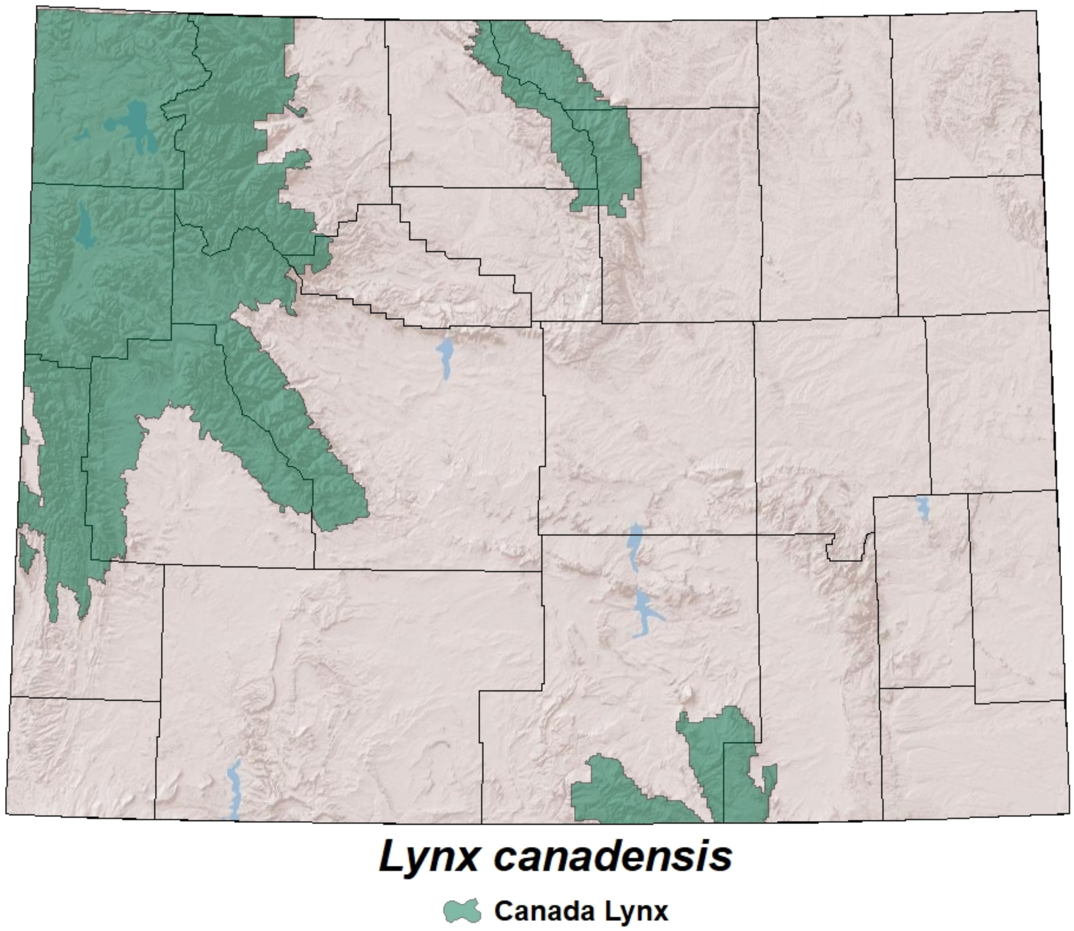
c. USFWS Status: Experimental (Shirley Basin population)

There is one non-essential experimental population of black-footed ferrets in Wyoming. Located in the Shirley Basin, ferrets were reintroduced in 1991.

Grasshopper suppression activities in Wyoming are not likely to jeopardize the continued existence of the species based on the fact, by definition; any effects to an experimental non-essential population of any species will not jeopardize the continued existence of the species. The Shirley Basin recovery area has historically not been a high grasshopper density area, so APHIS does not expect to have treatments in this area.

6. Canada Lynx; *Lynx canadensis*

a. Species Status Map

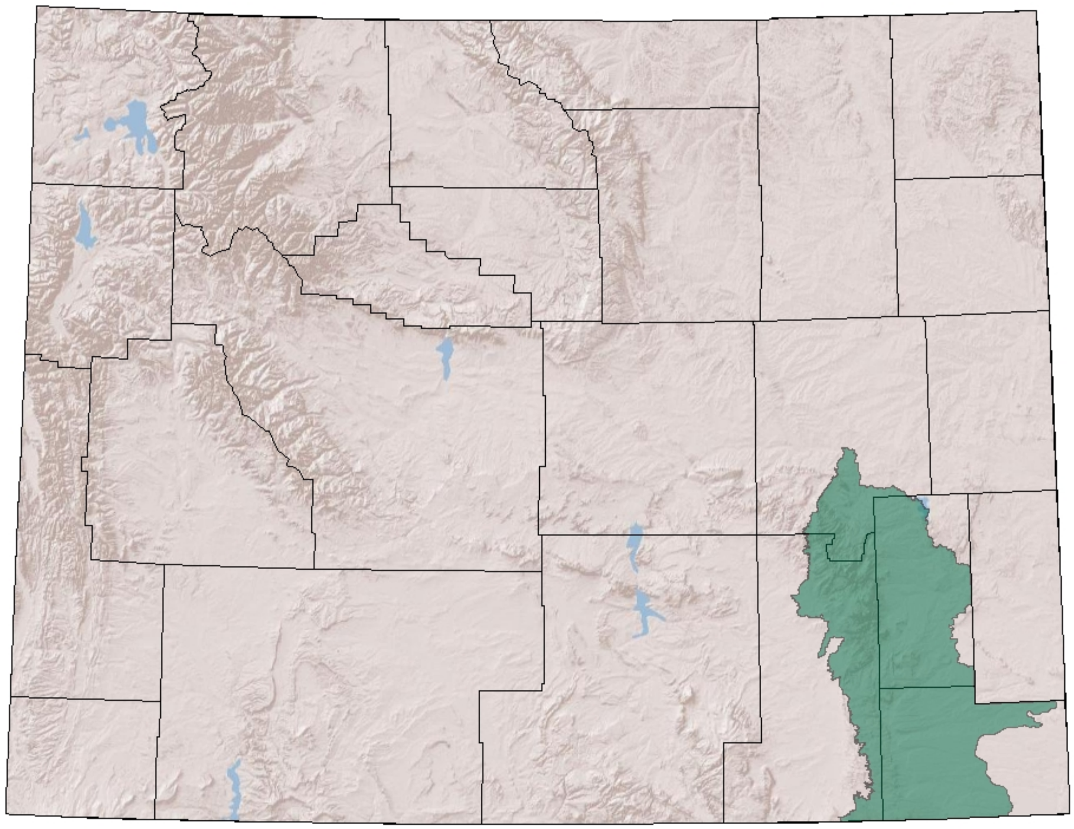



b. USFWS status: Threatened, Critical Habitat designated

APHIS grasshopper suppression programs will have no effect on the Canada Lynx or its designated critical habitat. It is not likely that APHIS grasshopper suppression programs will occur in areas of the lynx preferred habitat, boreal forests. If a suppression program does overlap with the critical habitat areas of the Canada Lynx, then a site specific consultation will be initiated with USFWS.

7. Preble's meadow jumping mouse; *Zapus hudsonius preblei*

a. Species Status Map




***Zapus hudsonius preblei***

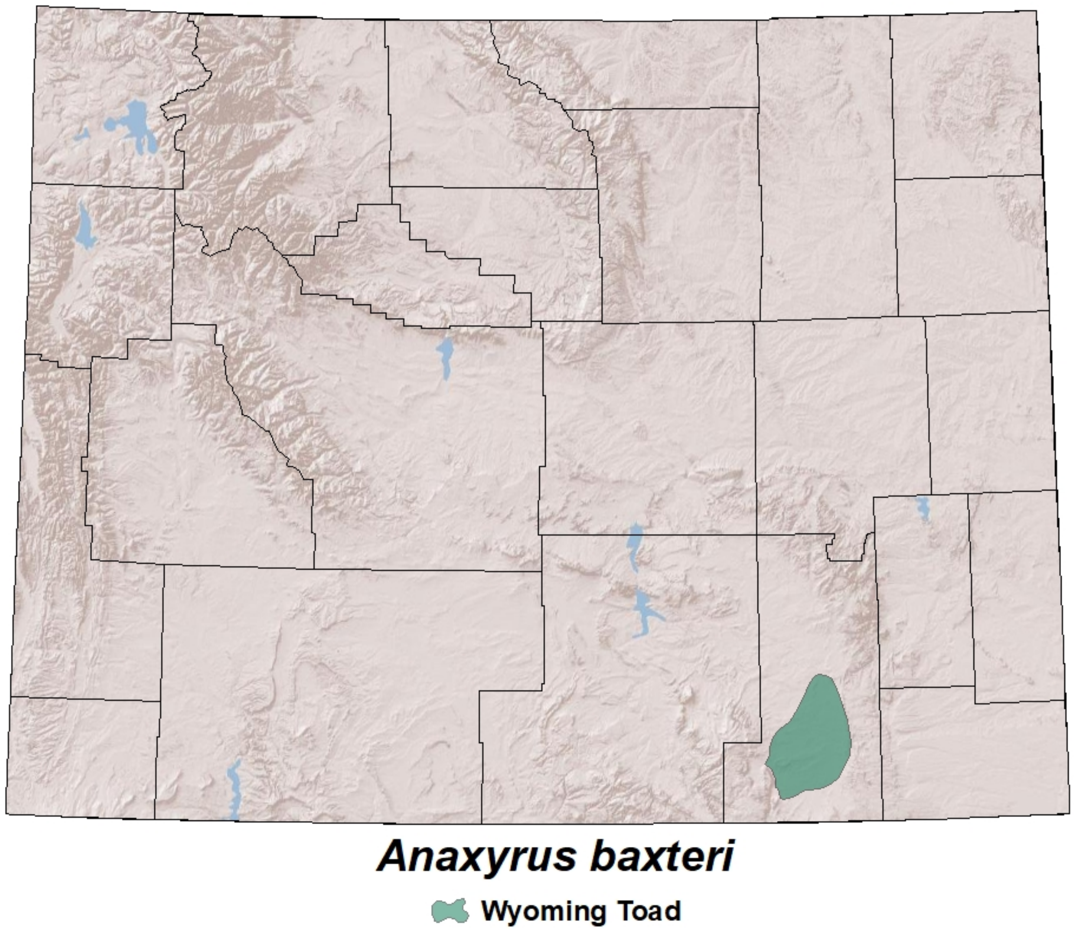
b. USFWS status: Threatened, Critical Habitat designated: Colorado only

Grasshopper suppression activities in Wyoming are not likely to adversely affect the Preble's meadow jumping mouse. It is not likely that APHIS grasshopper suppression programs will occur in areas of the mouse's preferred habitat due to a buffer placed around water and riparian areas. As per APHIS Grasshopper and Mormon cricket suppression program treatment guidelines, the following mitigation measures will be followed:

1. 500 foot standard programmatic buffer around water and riparian areas for aerial suppression programs.
2. 50 foot standard programmatic buffer around water and riparian areas for ground suppression programs will be increased to 500 foot buffer in Preble's meadow jumping mouse suitable habitat within the range of the species.

8. Wyoming toad; *Anaxyrus baxteri*

a. Species Status Map

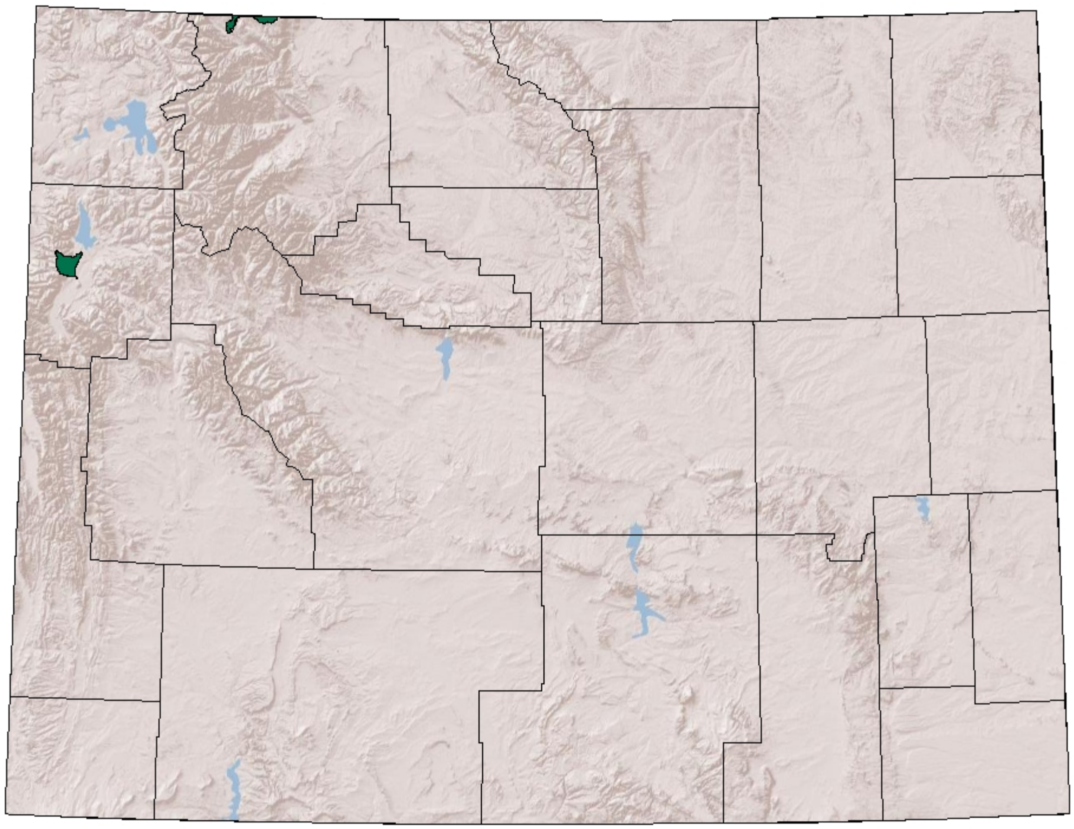



b. USFWS status: Endangered

Grasshopper suppression activities in Wyoming are not likely to adversely affect the Wyoming toad. It is not likely that APHIS grasshopper suppression activities will occur in the vicinity of Mortenson Lake. If suppression activities are conducted in Albany County, then the following impact minimization efforts will be put into place. A one mile buffer for aerial spray shall be maintained on each side of the Little Laramie River and no treatments will be applied within a one mile buffer of Mortenson NWR.

9. Western Glacier Stonefly; *Zapada glacier*

a. Species Status Map

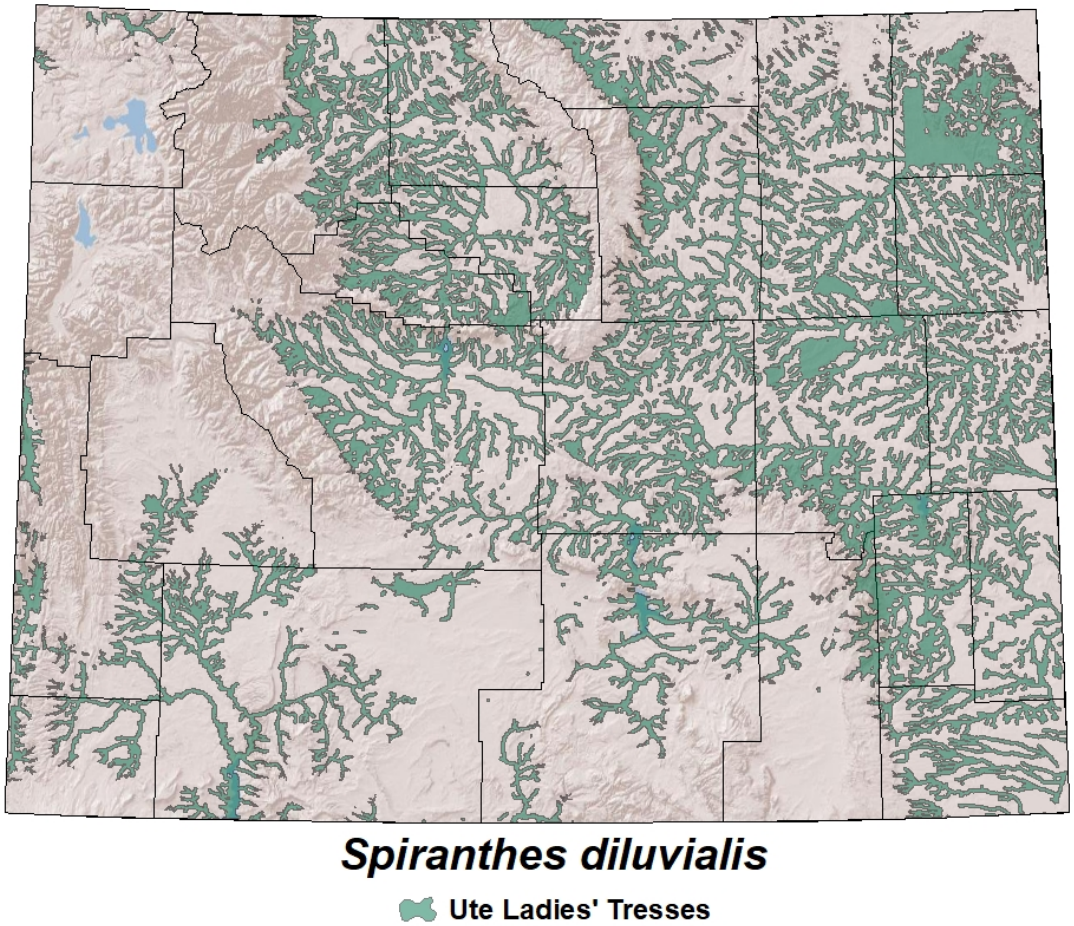



b. USFWS status: Threatened, Critical Habitat designated

Grasshopper suppression activities in Wyoming are not likely to adversely affect the Western Glacier Stonefly. It is not likely that APHIS grasshopper suppression programs will occur in areas of the stonefly's habitat, riparian areas due to a programmatic buffer placed on either side of streams or water bodies. This 500 foot buffer is standard procedure for all USDA APHIS PPQ grasshopper aerial suppression programs. For those areas that may be treated using ground equipment the 50 foot buffer will be increased to 500 feet around waters and riparian areas that are Western Glacier Stonefly suitable habitat, within the range of the species.

10. Ute ladies' tresses; *Spiranthes diluvialis*

a. Species Status Map




b. USFWS status: Threatened

Grasshopper suppression activities in Wyoming are not likely to adversely affect the Ute ladies' tresses. APHIS will take the following impact minimization measures for the protection of pollinators if a spray block occurs within known occupied habitat. The latest data available from WYNDD will be used to determine the known distribution of Ute ladies' tresses. If treatments occur after August 1st the following buffers will be put in place for areas of potential habitat and known populations of Ute ladies' tresses in addition to the programmatic 500 foot buffer from water bodies.

1) No aerial application of carbaryl or malathion or gamma-cyhalothrin within 3 miles of the known occupied habitat.

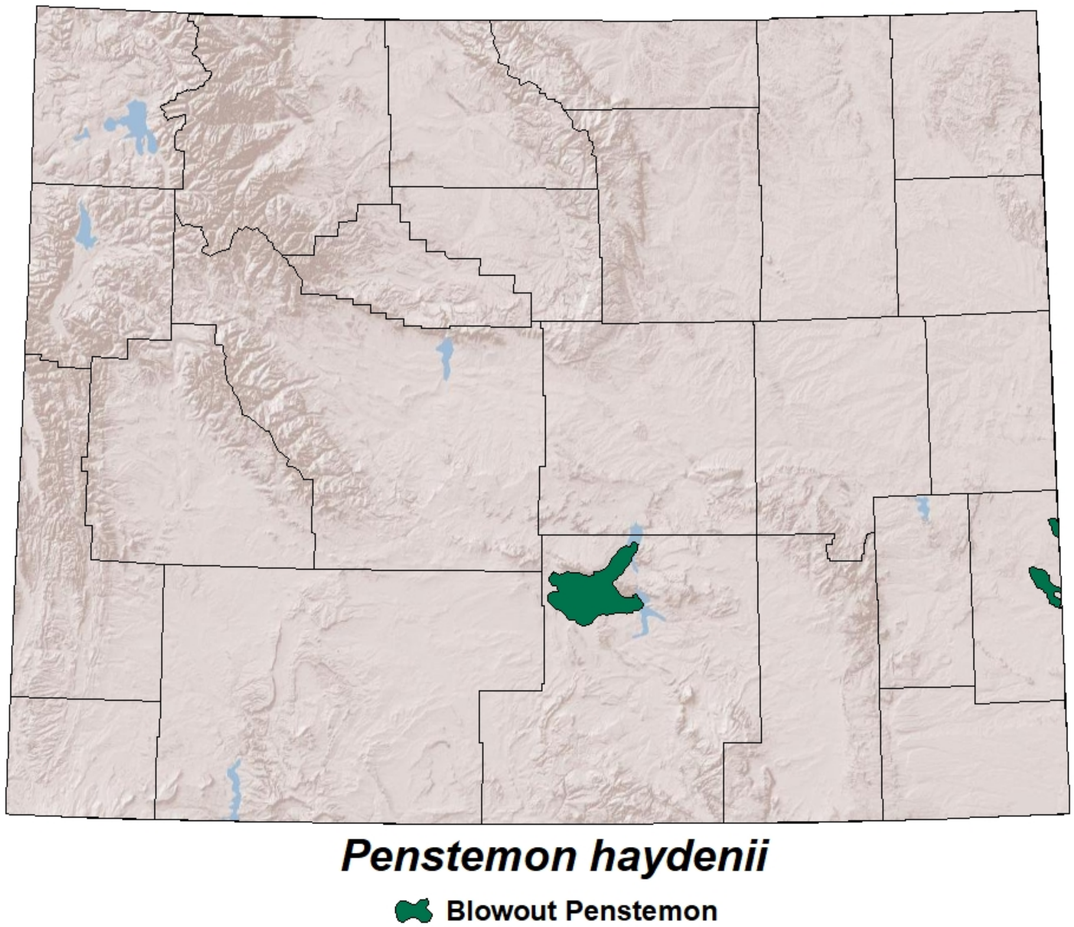
2) Only carbaryl bran bait or diflubenzuron combined with RAATs will be used within the 3 mile buffer.

3) No application of carbaryl bran bait will be applied within a 0.25 mile buffer of the potential range of species.

4) No buffer is required for diflubenzuron as it has no effect on adult insect pollinators. A 50 foot buffer for ground applications will be applied.

11. Blowout penstemon; *Penstemon haydenii*

a. Species Status Map




b. USFWS status: Endangered

Grasshopper suppression activities in Wyoming are not likely to adversely affect the blowout penstemon. APHIS will take the following impact minimization measures for the protection of pollinators if a spray block occurs within the USFWS potential range of species.

1) No aerial application of carbaryl or malathion or gamma-cyhalothrin within 3 miles of the potential range of species.

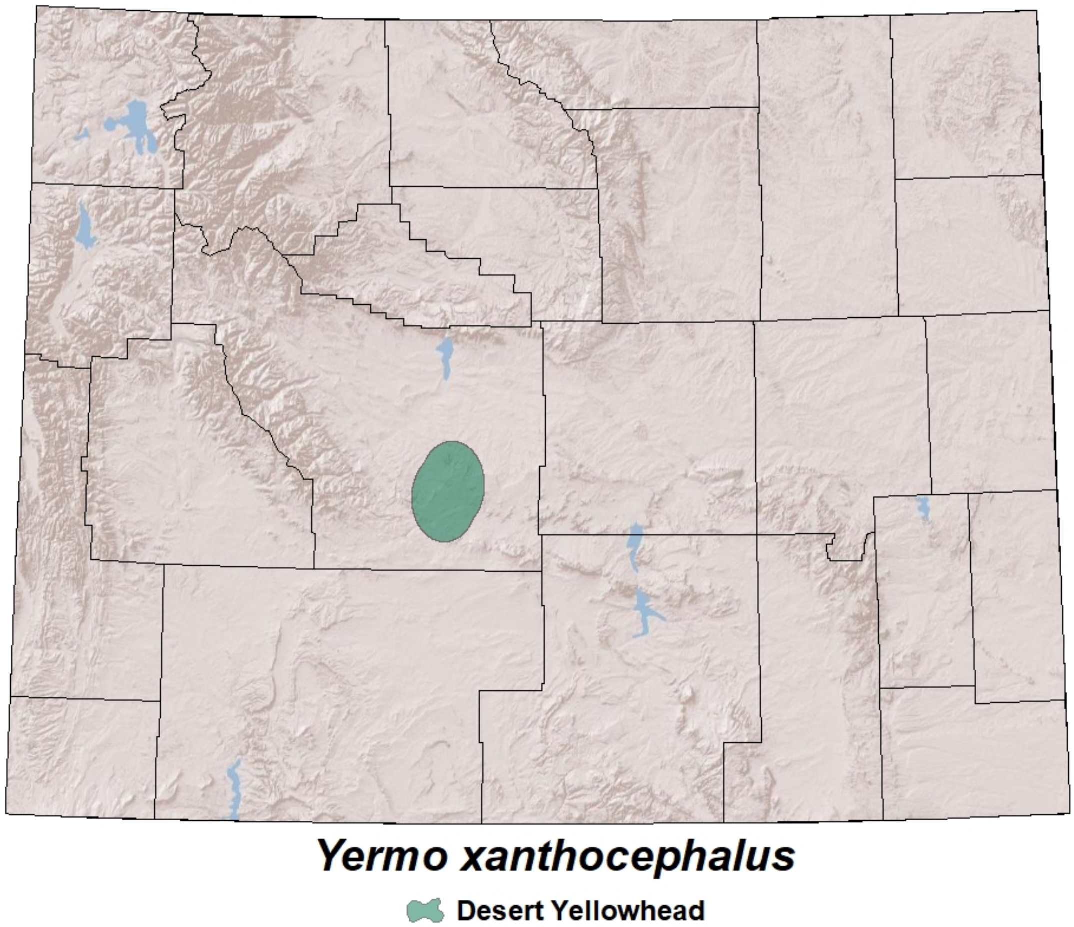
2) Only carbaryl bran bait or diflubenzuron combined with RAATs will be used within the 3 mile buffer.

3) No application of carbaryl bran bait will be applied within a 0.25 mile buffer of the potential range of species.

4) No buffer is required for diflubenzuron as it has no effect on adult insect pollinators. A 50 foot buffer for ground applications will be applied.

12. Desert Yellowhead; *Yermo xanthocephalus*

a. Species Status Map




b. USFWS status: Threatened, Critical Habitat designated

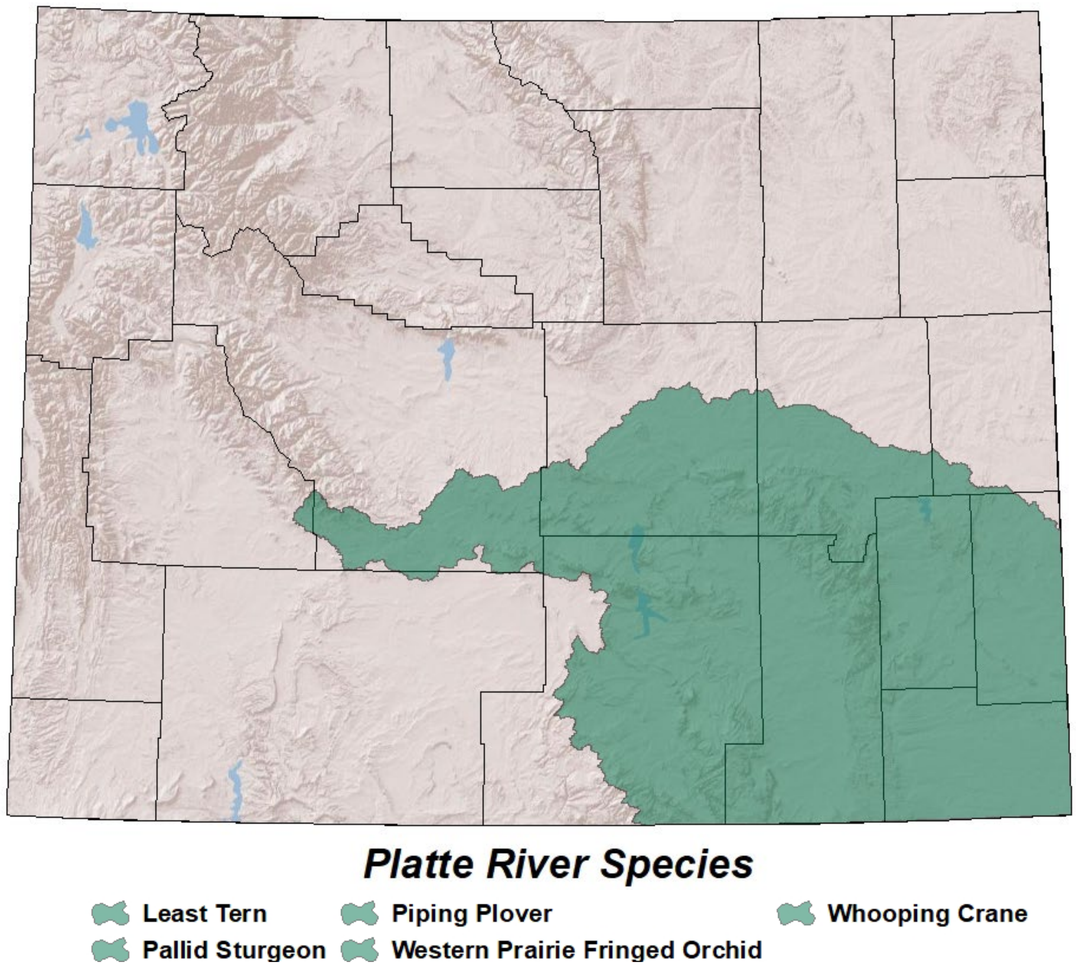
Grasshopper suppression activities in Wyoming are not likely to adversely affect the desert yellowhead or its designated critical habitat. APHIS will take the following impact minimization measures for the protection of pollinators if a spray block occurs within critical habitat or occupied habitat.

1. No aerial application of carbaryl or malathion or gamma-cyhalothrin within 3 miles of the critical habitat or known occupied habitat.
2. Only carbaryl bran bait or diflubenzuron combined with RAATs will be used within the 3 mile buffer.
3. No application of carbaryl bran bait will be applied within a 0.25 mile buffer of the potential range of species.
4. No buffer is required for diflubenzuron as it has no effect on adult insect pollinators. A 50 foot buffer for ground applications will be applied.

13. River Species

a. Platte River Species

Least Tern - Interior Population (*Sterna antillarum*) Status: Endangered
Pallid Sturgeon (*Scaphirhynchus albus*) Status: Endangered
Piping Plover (*Charadrius melodus*) Status: Endangered
Western Prairie Fringed Orchid (*Platanthera praeclara*) Status: Threatened
Whooping Crane (*Grus americana*) Status: Endangered



b. Colorado River Fish Species

Bonytail (*Gila elegans*) Status: Endangered

Coloradao Pikeminnow (*Ptychocheilus lucius*) Status: Endangered

Humpback Chub (*Gila cypha*) Status: Endangered

Razorback Sucker (*Xyrauchen texamus*) Status: Endangered


Grasshopper suppression activities in Wyoming will have no effect on any of the river species listed by the USFWS. Suppression activities will not deplete any water sources listed as tributaries to the Platte or Colorado River system nor will any activities have any effect on water quality downstream from Wyoming.

# Appendix 4: Yellow-Billed Cuckoo (YBC) Risk Summary for Grasshopper and Mormon Cricket Suppression Program

The distinct population segment of the yellow-billed cuckoo (*Coccyzus americanus*) west of the Continental Divide is listed under the ESA as a threatened species (USFWS, Oct. 2014). Hereafter, the western distinct population segment of the YBC will be referred to as the YBC.

The acute toxicity of Program insecticides, in particular carbaryl and diflubenzuron, range from practically non-toxic to highly toxic for birds, in the case of carbaryl, and practically non-toxic in the case of diflubenzuron (USDA APHIS, 2015). Carbaryl avian toxicity is variable based on the test species with the European starling, (*Sturnis vulgaris*) being the most sensitive and the ring-necked pheasant, *Phasianus colchicus*, being the least sensitive bird species (USDA APHIS, 2015). Carbaryl acts by inhibiting the neurotransmitter, AChE, while diflubenzuron acts to inhibit chitin synthesis in developing invertebrates. Chronic toxicity between the two chemistries is similar with a lack of effects at field-relevant doses (USDA APHIS, 2015). The potential for risk to the YBC from the proposed use of program insecticides is related to the toxicity of each chemical and the probability of exposure which is discussed below.

Direct exposure to the YBC from proposed grasshopper and Mormon cricket applications is expected to be unlikely. The YBC use riparian habitats that contain willow-cottonwood and other woodland habitats. Optimal habitat size for the YBC is 200 acres with nesting rarely occurring in sites that are less than 50 acres. Forested areas typically have dense closed canopies. Nesting usually occurs in willow trees of various species but may also occur in other riparian tree species (USFWS, 2014). These are habitats that are not part of the Program for treatment and due to their proximity to water would have no application buffers regardless of whether they may contain YBC or their designated suitable habitat. In cases where there are YBC and/or suitable habitat APHIS increases the no application buffer which further reduces the potential for direct exposure to any Program applications. Estimates of drift from the use of proposed treatments and no application buffers suggest that any potential residues that could move into YBC habitat would be below any potential for direct risk (USDA APHIS, 2015). The presence of dense, closed canopies of riparian trees in YBC habitat would also serve to intercept and remove the small amount of insecticide that could drift into these types of habitat.

Dietary exposure from ingestion of contaminated prey or water is also not anticipated to be a major pathway of exposure for the YBC. There may be some incidental consumption of program insecticides that could be on the surface of some insect prey that receive a sublethal dose following treatment, however, there is not a plausible exposure scenario that could result in the ingestion of enough prey to result in risk to the YBC. Insects that receive a lethal dose would not be available for foraging by the YBC since they prefer live prey items. In the case of carbaryl bait applications, the probability of exposure would be less since the material is not applied as a liquid where it could result in residues on the surface of insects. Dietary exposure from the ingestion of contaminated surface water is also not anticipated to be a major pathway of exposure for the YBC. The program use of no application buffer zones from aquatic areas minimizes the potential for exposure to surface water.

Indirect impacts to the YBC from loss of invertebrate and vertebrate prey items due to program treatments are not anticipated. The YBC has a varied diet including invertebrates as well as some vertebrates including tree frogs and lizards. Diet studies show that approximately 45% of its diet consists of lepidopteran larvae, followed by tree frogs (24%), katydids (22%), grasshoppers (9%) and the remaining amount from various invertebrates including, but not limited to beetles, flies, spiders, caddisflies, dragonflies, crickets and cicadas (USFWS, 2014). This preference may change based on availability of large invertebrate fauna. YBC prefer nesting and foraging in tree canopies along riparian corridors using a "sit and wait" strategy watching foliage movement for prey items (USFWS, 2014). The primary constituent elements and preferred habitat of YBC for nesting and foraging are not areas where the Program will be making applications. Proposed no application buffers from suitable habitat and known locations of the YBC, as well as the use of Reduced Agent Area Treatments (RAATs) where applications will occur adjacent to habitat would mitigate the impacts to potential food items for the YBC. In cases where YBC would forage outside of their preferred habitat there would be adequate food items for foraging based on their varied diet and the lack of effects to terrestrial invertebrates and vertebrates in the no application buffer zones that have been proposed, as well as negligible impacts to non-target terrestrial invertebrates and vertebrates in treatment blocks. The impacts to non-target invertebrates within treatment blocks from Program applications are summarized below and show minimal impacts to most non-target terrestrial invertebrates.

Available field studies suggest the program insecticide applications have minimal impacts to non-target terrestrial invertebrates (Quinn et al., 1990; Swain, 1986; Smith et al., 2006). Smith et al. (2006) assessed changes in non-target arthropod populations following applications of carbaryl, diflubenzuron, or malathion using RAATs. In the 2-year study, post application surveys of the major insect fauna revealed that only ants were negatively affected by grasshopper applications within treatment areas. As stated previously, Weiland et al. (2002) assessed the impacts of Sevin XLR Plus applications at 750 g a.i./ha to several invertebrate groups over a 21-day period. This rate equates to 0.67 lb a.i./ac which is 1.34 times higher than the highest rate allowed in the program. Results from the study demonstrated no negative effects on abundance in the following insect groups: Homoptera, Hymenoptera, Coleoptera, Hemiptera, Lepidpotera, and Neuroptera. Previously conducted research, as well as field studies carried out as part of the grasshopper IPM project, indicates that diflubenzuron has minimal impact on most terrestrial non-target arthropods (Catangui et al., 1996). Weiland et al. (2002) in Wyoming monitored the effects of Dimilin 25W for 21 days post-application on terrestrial invertebrates after full treatment applications of 17.5 and 52.5 g a.i./ha. From high and low sweep net captures, no effect on invertebrates in the orders Homoptera, Hymenoptera, Coleoptera, Hemiptera, Lepidoptera, or Neuroptera were found. There was a statistically significant increase in Diptera and a statistically significant decrease in Araneae (spiders) but the authors question the spider analysis since untreated populations dropped dramatically during the study. Tingle (1996) assessed the impacts of diflubenzuron applications in two field trials occurring in two separate years with applications of 93 g a.i./ha (0.08 lb a.i./ac). Based on an analysis of 28 taxonomic groupings only two were affected and included non-target grasshoppers and lepidopteran larvae. This effect only occurred in the treated areas but did not occur in the untreated buffer areas that were sampled. Grasshopper IPM field studies have shown diflubenzuron to have a minimal impact on ants, spiders, predatory beetles, and scavenger beetles. There was no significant reduction in populations of these species from 7 to 76 days after treatment. Although ant populations exhibited declines of up to 50%, these reductions were temporary, and population recovery was described as immediate (Catangui et al., 1996). No significant reductions in flying non-target arthropods, including honey bees, were reported. Within one year of diflubenzuron applications in a rangeland environment, no significant reductions of bee predators, parasites, or pollinators were observed for any level of diflubenzuron treatment (Catangui et al., 1996). Graham et al. (2008) evaluated the impacts of diflubenzuron treatments on aquatic and terrestrial invertebrates for Mormon cricket suppression in Utah. Most terrestrial invertebrate taxa were not significantly different pre- and post-treatment among three sites that were evaluated. There was a noted decrease in some ant genera, but results were not consistent between sites and not all genera were impacted. Non-ant Hymenoptera showed increased numbers at two of the three sites and a decrease at a third site when comparing numbers pre- and post-treatment. Impacts to aquatic invertebrates, such as caddisflies and dragonflies, that may serve as prey for the YBC would be minimal due to the implementation of Program no-application buffer zones adjacent to aquatic habitat. Impacts to vertebrate food items for the YBC such as frogs and lizards would also be minimal based on risk estimates for each Program insecticide and the proposed mitigation to protect the YBC (USDA APHIS, 2015).

Based on the qualitative risk assessment above and the proposed mitigation for protection of YBC and its suitable habitat, APHIS has determined that the Program may affect but is not likely to adversely affect the YBC.

<u>References</u>

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# Appendix 5: Northern Long-Eared Bat (NLEB) Risk Summary for Grasshopper and Mormon Cricket Suppression Program

The acute toxicity of Program insecticides, in particular carbaryl and diflubenzuron, are considered moderate for mammals, in the case of carbaryl, and practically non-toxic in the case of diflubenzuron (USDA APHIS, 2015). Similar differences in toxicity between the two insecticides are seen in sublethal and chronic studies, as well. The difference in toxicity between the two insecticides is related to the mode of action. Carbaryl acts by inhibiting the neurotransmitter, AChE, while diflubenzuron acts to inhibit chitin synthesis in developing invertebrates. The potential for risk to the NLEB from the proposed use of program insecticides is related to the toxicity of each chemical and the probability of exposure.

Direct exposure to the northern long-eared bat from proposed grasshopper and Mormon cricket applications is expected to be minimal. Program applications will occur during the day when bats are not foraging and would be under bark on trees, in crevices, and in mines or caves where exposure to drift would be limited (USFWS, 2014). Emerging at dusk, most hunting occurs above the understory, 1 to 3 meters (m) (3 to 10 feet (ft)) above the ground, but under the canopy (Nagorsen and Brigham, 1993) on forested hillsides and ridges, rather than along riparian areas (Brack and Whitaker, 2001; LaVal et al., 1977). This coincides with data indicating that mature forests are an important habitat type for foraging northern long-eared bats (Caceres and Pybus, 1997). Occasional foraging also takes place over forest clearings and water, and along roads (van Zyll de Jong, 1985). Foraging patterns indicate a peak activity period within 5 hours after sunset followed by a secondary peak within 8 hours after sunset (Kunz, 1973). The preferred foraging areas for the NLEB are areas that would not receive grasshopper or Mormon cricket treatments. In addition, treatments would not occur during peak foraging activity reducing the potential for exposure to Program insecticides.

Dietary exposure from ingestion of contaminated prey or water is also not anticipated to be a major pathway of exposure for the northern long-eared bat. There may be some incidental consumption of program insecticides that could be on the surface of some insect prey that receive a sublethal dose following treatment, however, there is not a plausible exposure scenario that could result in the ingestion of enough prey based on the daily food consumption rates for similar *Myotis* species. Insects that receive a lethal dose would not be available for foraging by the NLEB since they prefer live prey items. In the case of carbaryl bait applications, the probability of exposure would be less since the material is not applied as a liquid where it could result in residues on the surface of insects. Dietary exposure from the ingestion of contaminated surface water is also not anticipated to be a major pathway of exposure for the NLEB. The program use of no application buffer zones from aquatic areas minimizes the potential for exposure to surface water.

Indirect impacts to the NLEB from loss of invertebrate prey items due to program treatments are not anticipated. NLEB depends on a variety of invertebrates in its diet using foraging behaviors including hawking and gleaning of insect prey from plant surfaces and water (Ratcliffe and Dawson, 2003). Its diet may include insects from the orders Lepidoptera, Neuroptera, Coleoptera, Trichoptera, Hymenoptera, Diptera, Hemiptera, and Homoptera (Thomas et al., 2012; Feldhamer et al., 2009; Carter et al., 2003; Lee and McCracken, 2004). Coleoptera and Lepidoptera appear to make up the largest percentage of their diet, although proportions vary spatially and temporally, similar to other *Myotis* species, suggesting opportunistic feeding for available flying invertebrates (Griffith and Gates, 1985; Whitaker, 1972). Available field studies suggest the program insecticide applications have minimal impacts to non-target terrestrial invertebrates (Quinn et al., 1990; Swain, 1986; Smith et al., 2006). Smith et al. (2006) assessed changes in non-target arthropod populations following applications of carbaryl, diflubenzuron, or malathion using RAATs. In the 2-year study, post application surveys of the major insect fauna revealed that only ants were negatively affected by grasshopper applications within treatment areas.

As stated previously, Weiland et al. (2002) assessed the impacts of Sevin XLR Plus applications at 750 g a.i./ha to several invertebrate groups over a 21-day period. This rate equates to 0.67 lb a.i./ac which is 1.34 times higher than the highest rate allowed in the program. Results from the study demonstrated no negative effects on abundance in the following insect groups: Homoptera, Hymenoptera, Coleoptera, Hemiptera, Lepidpotera, and Neuroptera. Previously conducted research, as well as field studies carried out as part of the grasshopper IPM project, indicates that diflubenzuron has minimal impact on most terrestrial non-target arthropods (Catangui et al., 1996). Weiland et al. (2002) in Wyoming monitored the effects of Dimilin 25W for 21 days post-application on terrestrial invertebrates after full treatment applications of 17.5 and 52.5 g a.i./ha. From high and low sweep net captures, no effect on invertebrates in the orders Homoptera, Hymenoptera, Coleoptera, Hemiptera, Lepidpotera, or Neuroptera were found. There was a statistically significant increase in Diptera and a statistically significant decrease in Araneae (spiders) but the authors question the spider analysis since untreated populations dropped dramatically during the study. Tingle (1996) assessed the impacts of diflubenzuron applications in two field trials occurring in two separate years with applications of 93 g a.i./ha (0.08 lb a.i./ac). Based on an analysis of 28 taxonomic groupings only two were affected and included non-target grasshoppers and lepidopteran larvae. This effect only occurred in the treated areas but did not occur in the untreated buffer areas that were sampled. Grasshopper IPM field studies have shown diflubenzuron to have a minimal impact on ants, spiders, predatory beetles, and scavenger beetles. There was no significant reduction in populations of these species from 7 to 76 days after treatment. Although ant populations exhibited declines of up to 50%, these reductions were temporary, and population recovery was described as immediate (Catangui et al., 1996). No significant reductions in flying non-target arthropods, including honey bees, were reported. Within 1 year of diflubenzuron applications in a rangeland environment, no significant reductions of bee predators, parasites, or pollinators were observed for any level of diflubenzuron treatment (Catangui et al., 1996). Graham et al. (2008) evaluated the impacts of diflubenzuron treatments on aquatic and terrestrial invertebrates for Mormon cricket suppression in Utah.

A majority of terrestrial invertebrate taxa were not significantly different pre- and post-treatment among three sites that were evaluated. There was a noted decrease in some ant genera, but results were not consistent between sites and not all genera were impacted. Non-ant Hymenoptera showed increased numbers at two of the three sites and a decrease at a third site when comparing numbers pre- and post-treatment. Impacts to aquatic invertebrates that may serve as prey would be minimal due to the implementation of Program no-application buffer zones adjacent to aquatic habitat.

Based on the qualitative risk assessment above, APHIS has determined that the Program will not jeopardize the continued existence of the northern long-eared bat foraging and in roosts in the program area.

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# Appendix 6: Comments Received During Open Comment Period

USDA APHIS received several public responses to the publication of the Wyoming draft EA (EA Number: WY-21-01). Public comments were received from BLM field offices, WGFD and USFWS. Public comments were also received from the Xerces Society and from the Center for Biological Diversity. Comments similar in nature were grouped under one response. Comments that were editorial in nature or requested additional citations are not addressed in the appendix but were incorporated into the final EA, where appropriate. The Grasshopper Program has decided not to use chlorantraniliprole in Wyoming during 2021, any exposure scenarios which the commenters are concerned about are not relevant, and references to this chemical have been removed from the final EA.

<u>Wyoming Game and Fish Department Comment and APHIS Response</u>

1. **The Department recommends that APHIS coordinate with the U.S. Fish and Wildlife Service to include language to address impacts and protection for the western bumble bee, Suckley cuckoo bumble bee, and the American bumble bee as these are species that have been petitioned for protection under the Endangered Species Act in the State of Wyoming and may be impacted by pesticide application.**

**Response:** APHIS appreciates the Department's awareness and concerns for these species. APHIS's EIS, Wyoming's EA, and Program Treatment Protocols are followed closely when grasshopper suppression treatments occur, mitigating risk to pollinators such as bumble bees. The 2021 USFWS official species list for these Environmental Assessments (EAs) (WY-21-01) covering the rangeland action areas for ESA Section 7 consultations with U.S. Fish and Wildlife Service, covered consultations on species from this official list. The USFWS does not give concurrence for candidate species. APHIS will continue communications with USFWS as these species progress through the process of a listed determination.

<u>Center for Biological Diversity Comment and APHIS Response</u>

2. **"All comments from last year are equally applicable this year as the 2021 draft EAs suffer from the same or similar deficiencies as the 2020 ones, are incorporated by reference and are attached as Appendix A. Also, comments on these EAs by the Xerces Society for Invertebrate Conservation from both 2021 and 2020 are equally applicable, incorporated by reference and attached as Appendix B and C".**

**Response:** The responses for comments 1 through 161 are found in the 2020 EA's. These responses are equally applicable for the 2021 draft EA's.

<u>Xerces Society Comment and APHIS Response</u>

### 3. The EA Fails to Disclose Treatment Request Locations and Does Not Adequately Describe the Affected Environment or Analyze Impacts to the Affected Environment.

The Draft EA provides almost no information in the way of solid information about where, how, and when the treatments may actually occur within the counties covered under the EA, during the year 2021. As a result, it is impossible to determine if applications might occur to sensitive areas or species locations within the specified counties. Similarly, the scale of potential applications is left out. Without a description of the average size of treatments in this state and the range over say, the last 25 years, we don't know how to assess the potential impact of the treatments.

As APHIS explains in the EA, APHIS only conducts treatments after receiving requests. It is our understanding that a state's treatment requests must be submitted for funding approval to headquarters in Washington D.C., and that this budget requesting work occurs during the winter. Therefore, the locations of areas where requests have been received must exist in APHIS files. We believe this should be used to disclose maps of higher probability treatment areas, together with an estimate of acres to be treated and likely method and chemical -- in the Draft EA and certainly by the Final EA. After all, treatments commonly occur within weeks after the Final EA is published, so APHIS doesn't start planning for these after the Final EA.

The lack of transparency about proposed and historical treatment areas, particularly on public lands, is a disservice to the public and prevents the public from reviewing sufficient information to be able to gauge the justification for and the risks involved in the suppression effort. Furthermore, as a result of the lack of specificity in the EA, it is impossible to determine whether effects would actually be significant or not.

Obviously, final treatment decisions should hinge on a firm understanding of nymphal densities as well as other conditions related to the economic threshold, as described by APHIS, and it could be that APHIS would decide not to treat an area that was included in a budget request. Nonetheless, in order to adequately inform the public, describe the affected environment, and project impacts, APHIS should provide the treatment request areas with the EA, even if actual treatments end up less than these.

We appreciate that the Wyoming APHIS office has included the following clause:

> *"For stage 2, when the program receives a treatment request and determines that treatment is necessary, the specific site within Wyoming will be extensively examined to determine if environmental issues exist that were not covered in this EA. This stage is intended mainly to ensure that significant impacts in the specific treatment area will not be experienced. A supplemental determination will be prepared to document this finding and would also address any comments received on this EA. Supplemental determinations prepared for specific treatment sites will be provided to all parties who comment on this EA."*

**Response:** Treatment requests are received before the survey season begins, but they are very dynamic and can change week-to-week. Arbitrarily publishing requested treatment locations in the draft EA would not accurately reflect future treatment actions. Treatment locations on public land cannot be described accurately in the EA because the exact location is only known after nymphal surveys are conducted. Grasshopper nymphal stages generally develop every 5-12 days depending on environmental temperature. If draft EAs are published after nymphal surveys dictate treatment locations the grasshopper life stage would advance to the point that treatments with diflubenzuron could no longer take place. Please see the APHIS responses to comments 1, 2, 3, 4, 5, 6, 8, 54, 92, 93, 97, 100, and 159 in the 2020 EAs.

**4. APHIS includes only a single action alternative and fails to analyze other reasonable alternatives, such as buying substitute forage for affected leaseholders. In addition, the single action alternative combines conventional and RAATs applications in one alternative, while the consequences do not fully explore and explain the relative impacts of these two methods.**

As described in the 2019 EIS, potential outcomes of forage loss on a leaseholder's plot of land, should it be untreated, could be the rancher seeking to buy alternative sources of forage, leasing alternative lands, or selling livestock. The EIS did not fully evaluate these options, so it is important that the EA go further. For example, a reasonable alternative that could be examined would be for the federal government to subsidize, fully or partially, purchased hay. But in its current form, the EA includes no discussion of a reasonable alternative such as this.

Instead, the EA contains a single action alternative that encompasses suppression treatments using either the "conventional" method (i.e. full rates, blanket coverage) or the RAATs method (i.e. reduced rates, skipped swaths). Given that these two options are combined into a single alternative the consequences section should be careful to fully analyze the impact of the treatments at the conventional rates with blanket coverage. However in many cases APHIS focuses simply on the RAATs method and does not discuss impact from the "conventional" method. As an example, this language is included for the discussion of carbaryl impacts on pollinators: "In areas of direct application where impacts may occur, alternating swaths and reduced rates (i.e., RAATs) would reduce risk." In other cases, APHIS provides an assessment but does not indicate if its risk conclusion applies to the conventional method and the RAATs method, or one or the other.

**Response:** The APHIS grasshopper suppression program draws its authority from the Plant Protection Act of 2000 (7 U.S.C § 7717). The statute authorizes APHIS to authority to exclude, eradicate, and control plant pests, including grasshoppers. Specifically, language in the PPA provides authority for APHIS to protect rangeland from "economic infestation" of grasshoppers. In its recent EIS updating the program (APHIS 2019), the Agency describes its determination of an economic infestation as follows:

*The "level of economic infestation" is a measurement of the economic losses caused by a particular population level of grasshoppers to the infested rangeland. This value is determined on a case-by-case basis with knowledge of many factors including, but not limited to, the following: economic use of available forage or crops; grasshopper species, age, and density present; rangeland productivity and composition; accessibility and cost of alternative forage; and weather patterns. In decision-making, the level of economic infestation is balanced against the cost of treating to determine an 'economic threshold'* *below which there would not be an overall benefit for the treatment. Short-term economic benefits accrue during the years of treatments, but additional long-term benefit may accrue and be considered in deciding the total value gained by a treatment.*

The Plant Protection Act of 2000 does not give authority to APHIS to purchase replacement feed for ranchers, but rather only provides funding when available to suppress outbreak populations of grasshoppers to save forage.
The commenter is correct that APHIS believes the use of RAATs mitigates the risk to non-target insects including pollinators. However, APHIS does not solely rely on the reduced deposition of pesticides in the untreated swaths to determine the potential harmful effects of grasshopper treatments will not cause significant impacts. The environmental consequences risk analysis of carbaryl and diflubenzuron treatments using conventional methods (total area coverage and higher application rates) is provided on pages 20-26 of the 2021 EAs. Additional descriptions of APHIS' analysis methods and discussion of the toxicology can be found in the 2019 EIS.

**5. Impacts are described as "reduced" in many portions of the environmental consequences section but APHIS rarely describes "reduced" in comparison to anything else**.

APHIS liberally employs relative language to create an impression of low risk. For example, in numerous locations in the environmental consequences section of the EA, APHIS described risk as "reduced." Reduced compared to what, exactly? The inexactness and lack of specificity of such statements make the EA of little utility for a citizen trying to determine the actual predicted impacts of insecticide spray on large blocks of Western rangelands.

**Response:** The commenter is too vague to be able to respond accurately to this comment. Often in the EA the term Reduced Agent Area Treatment (RAAT), typically described as the RAATs treatment method, is used. Compared to conventional blanket applications of pesticide, the RAATs strategy uses a reduced rate by alternating treatment swaths in a spray block, reducing application rates, or both.

**6. APHIS has not demonstrated that treatments in Wyoming in 2021 meet the "economic infestation level." No site-specific data is presented in the EA that justifies the treatment based on the "economic infestation level."**

The APHIS grasshopper suppression program draws its authority from the Plant Protection Act of 2000 (7 U.S.C § 7717). The statute authorizes APHIS with the authority to exclude, eradicate, and control plant pests, including grasshoppers. Specifically, language in the PPA provides authority for APHIS to protect rangeland from "economic infestation" of grasshoppers. In its recent EIS updating the program (APHIS 2019), the Agency describes its determination of an economic infestation as follows:

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Such a measure is in accordance with general IPM principles that treatments should only occur if it is judged that the cost of the treatment is less than the revenues expected to be received for the product.

One would expect that APHIS would have undertaken such an analysis in the EIS or the site-specific EAs—or at least model it—so as to determine whether the treatments might be justified because they have reached a "level of economic infestation." Yet none of the variables are discussed in the EA at all, nor is site-specific data presented for any of these, and the reader is left to simply assume that all treatments obviously meet the economic threshold.

On public lands, from a taxpayer point of view, it makes sense that—as the grasshopper suppression effort is a federally supported program—costs of the treatment to the taxpayer should be compared to the revenues received by the taxpayer for the values being protected (livestock forage) on public lands.

Typical costs per acre can be obtained from previous treatments. For example, according to an Arizona 2017 Project Planning and Reporting Worksheet for DWP# AZ-2017-02 Revision #1 (Post treatment report) the cost of treatment amounted to $8.72/treated acre, or $3.99/"protected acre."[1] In 2019, similar post-treatment reports report the costs as $9.39 per treated acre and $4.41 per "protected acre". Note that these costs summaries only include what appear to be the direct costs of treatment (i.e. salaries and per diem of the applicators, chemical, etc.). Administrative costs do not appear to be included in these cost estimates, nor do nymph or adult survey costs.

(Footnote 1: The first figure applies to the cost for areas directly sprayed, the latter figure calculates a larger "protected acre" figure assuming that treatment effects radiate out into untreated swaths. This report was obtained through a FOIA request.)

Information from a FAIRS Report (obtained through FOIA, not from APHIS' environmental documents) for aerial applications in Wyoming appear to indicate that aerial contracts cost between $9.76-$14.61/acre. However, the report is not easy to interpret and it is unclear if these are correct costs/acre.

Information from a summary of treatments conducted across Western states in 2017, 2018, and 2019 shows treatment costs for treatment costs for treated acres ranging from $4.43-$35.00 (2107); $9.34-$45.44 (2018), and $2.70-$35.60 (2019).

In determining whether a treatment is economically justified, one must ask what is the revenue expected to be received for the product? CARMA, the model used by APHIS to determine if a treatment should occur, shows that in Wyoming it takes from 0-30 acres of rangeland to support one animal unit- month (AUM). Currently, on federal BLM and Forest Service lands, the US taxpayer receives $1.35 per AUM. As a rough estimation, taking the median value within the carrying capacity range (15 acres per AUM), and calculating the value of the forage per acre as paid to the American taxpayer, the US taxpayer receives an estimated $0.09 per acre for the forage value on BLM or USFS federal rangelands in 2021.

Given that the direct costs of grasshopper treatments to the taxpayer appear to range from $2.20 up to $45.44/acre, it is clear that the economic threshold is nowhere near being met, at least on federal lands. The program makes no economic sense from the point of view of the taxpayer.

The ecological costs of treatment are not quantified in the EAs, but as we have pointed out in this EA, are numerous, and there is no evidence that they are not significant. It is unclear if the economic analysis that the PPA appears to require from APHIS is intended to include a quantitative assessment of ecological costs.

**Response:** Please see APHIS' responses to comments 1 and 2 above.
This comment is similar in nature to comments in the 2020 EA, please see the APHIS responses to comments 3, 4, 5, 6, 7, 8 from the 2020 EA's. The analysis provided by the commenter assumes all lands treated by APHIS in Wyoming are public. This is not the case. Due to the nature of the land ownership in Wyoming being checker-board, private lands are often included in treatments in order for it to make biological sense. The private landowners pay a direct portion of treatment costs. Therefore, the assumptions made in the analysis provided by the commenter is an overestimate to the taxpayer. The value of the forage is not based only on the grazing fees assessed by BLM or USFS. There are a range of additional costs associated with replacement feed, the cost of hay, the cost to ship the hay, the cost and labor to move the hay to the rangeland, the cost of moving the cattle from the grazing allotments, the cost to provide or build a hay barn to store the hay, etc. The replacement feed costs in Wyoming greatly out way any treatment costs accrued by the agency. The Plant Protection Act of 2000 does not give authority to APHIS to purchase replacement feed for ranchers, only provides funding when available to suppress outbreak populations of grasshoppers to save forage. In Wyoming there are no overhead or Administrative costs associated with the ground treatment costs provided by APHIS. The administrative costs associated with contractors providing aerial treatments are minimal. The IPM Manual prepared by USDA discusses the cost benefit analysis for grasshopper suppression programs.

**7. APHIS relies too heavily on broad assertions that untreated swaths will mitigate risk. Untreated swaths are presented as mitigation for pollinators and refugia for beneficial insects, but drift from ULV treatments into untreated swaths at typical aircraft heights is not fully disclosed, while studies are mischaracterized.**

This EA and the EIS claim that the use of untreated swaths will mitigate impacts to natural enemies, bees, and other wildlife. For example:

- Final EIS p. 34: *"With less area being treated, more beneficial grasshoppers and pollinators will survive treatment."*

- Final EIS P. 57: *"The use of RAATS provide additional benefits by creating reduced rates and/or untreated swaths within the spray block that will further reduce the potential risk to pollinators."*
- Final EIS p. 26. *"Studies using the RAATs strategy have shown good control (up to 85% of that achieved with a traditional blanket insecticide application) at a significantly lower cost and less insecticide, and with a markedly higher abundance of non-target organisms following application (Lockwood et al., 2000; Deneke and Keyser, 2011)."*
- Wyoming 2021 EA: *"Based on the review of laboratory and field toxicity data for terrestrial invertebrates, applications of diflubenzuron are expected to have minimal risk to pollinators of terrestrial plants. The use of RAATs provide additional benefits by using reduced rates and creating untreated swaths within the spray block that will further reduce the potential risk to pollinators."*

However, the width of the skipped swaths is not designated in advance in the EA, and there is no minimum width specified.

APHIS' citation of a study by Lockwood et al. (2000) to claim that RAATS treatments result in *"a markedly higher abundance of non-target organisms following application"* appears to be far too rosy an assessment. We note that:

- The study authors make clear that reduced impact to non-target arthropods was *"presumably due to the wider swath spacing width* [which measured 30.5 and 60 m in the study]*"*. Obviously, these swath widths are on the high end of what could be used under the EA.
- APHIS leaves out one of the key findings of the study: For carbaryl, the RAATs treatment showed lower abundance and biomass of non-targets after treatment compared to the blanket treatments on one of the two ranches at the end of the sampling period (28 days). Also, on both ranches, abundance and biomass reached their lowest points at the end of the study after treatment with carbaryl, so we don't know how long it took for recovery to occur.

Moreover, many features of the study several features of the study make it less than useful for predicting impacts under APHIS' current program. We note that:

- This study only investigated RAATs effects to non-targets for carbaryl, malathion, and fipronil, not on diflubenzuron.
- In addition, the study measured highest wind speeds at 6.0 mph, well below the maximum rate allowed under the operating guidelines indicated in the 2021 Treatment Guidelines (10 mph for aerial applications, no maximum wind speed specified for ground applications).
- The experimental treatment areas in the study (243 ha or 600 acres) were quite small compared to aerial treatment sizes that occur in reality (minimum 10,000 acres for aerial treatments). This could have allowed for recolonization from around the edges that would result in more rapid recovery, compared to a real-world treatment, some of which measure tens of thousands of acres.

APHIS also cited Deneke and Kyser (2011) to justify its statement that RAATs results in a *"markedly higher abundance of non-target organisms following application."* Deneke and Kyser's publication is an extension publication, not a research publication, and contains absolutely no data to show that RAATs conserves non-targets.

Neither the EA nor the 2019 EIS presented estimated environmental concentrations (EECs) in the untreated swaths and simply included statements that untreated swaths would reduce risk to nontargets. To fully understand expected environmental concentrations in treated swaths, it is important to have a clear assessment of drift under the conditions that occur under the APHIS grasshopper program. While APHIS' 2019 EIS described its use of a quantitative analysis of drift anticipated from ULV aerial applications (see HHERA for diflubenzuron) to estimate deposition into aquatic areas, the information presented in the EIS and HHERA is insufficient to fully understand expected environmental concentrations in untreated swaths. To better understand this issue, we looked more closely at several drift analyses and studies to better understand the potential for drift.

a) EPA (2018) in its most recent ecological risk assessment for diflubenzuron, included a low volume aerial drift analysis using the model AgDrift. EPA assumed a volume mean diameter (VMD) of 90 µm [note that this is approximately 2/3 of the VMD used in the APHIS analysis]. Under EPA's analysis, the drift fraction comprises 19% at 150 ft. However, this analysis is likely not helpful for most aerial APHIS grasshopper program applications, as the EPA analysis is based on a boom height of 10 feet while APHIS aerial release heights are typically much higher.

b) Schleier et al. (2012) performed field studies to measure environmental concentrations of ground-based ULV-applied insecticides. Sites contained little vegetative structure and a flat topography. The authors observed that an average of 10.4% of the insecticides sprayed settled out within 180 m (591 ft.) of the spray source. According to the authors, these results are similar to measurements in other studies of ground-based ULV applications using both pyrethroid and organophosphate insecticides, which found 1 to 30% of the insecticide sprayed deposits on the ground within 100 m (328 ft) of the spray source.

c) According to information APHIS provided to NMFS in a 2010 Biological Assessment (obtained through a FOIA request), actual aerial release heights are likely to be in the area of 75' above the ground (APHIS 2010). Modeling of drift using aerial methods and a 75' release height was conducted using the model AgDISP in this BA; modeling using ground methods was conducted using the model AgDRIFT. In both cases the droplet size was set as "very fine to fine" which corresponds to a Volume Mean Diameter (VMD) of 137.5 um.

Outputs from the models are very difficult to interpret from the information in the BA which is only presented as a chart with the y-axis at a scale too coarse to adequately interpret the results and decline at different points distant from the spray. However, for the aerial diflubenzuron application, it appears that the model predicts deposition at point zero (below the treated swath) to be approximately 1 mg/m2. APHIS states subsequently that the model predicts deposition at 500 feet to measure 0.87 mg/m2. Translated into lb/acre this means a deposition of 0.009 lb/A at point zero and 0.0078 lb/acre at 500 foot distance, with approximately a straight line of decreasing deposition between those two points.[2]

(Footnote 2: We use these figures later in estimating the effect of these estimated environmental concentrations on non-target pollinators.)

According to drift experts, the most important variables affecting drift are droplet size, wind speed, and release height (Teske et al. 2003). In analyzing these three drift analyses, we note that neither the Dimilin 2L label nor the Sevin XLR Plus label requires a minimum droplet size for ULV applications on grasslands and non-crop areas, for the control of grasshoppers and Mormon crickets. However, other uses of ULV technology for pest control assume much smaller droplet sizes than what APHIS has assumed (VMD of 137.5). For example, for ULV applications used in adult mosquito control operations, VMD measures between 8 and 30 µm and 90% of the droplet spectrum should be smaller than 50 µm (Schleier et al. 2012). EPA estimates VMD for ULV applications as 90 µm (USEPA 2018).

The EPA analysis is of very limited utility in predicting drift under the grasshopper spray program, based on the release height EPA used in its model, as pointed out above. And while it is helpful to have found the APHIS AgDISP analysis, we believe it—and the EIS and EAs that appear to rely on it—likely underestimates drift, and the resulting risk to non-targets within skipped swaths, as a result of several factors:

- The APHIS AgDISP analysis only analyzed deposition at the lower end of the application rate for diflubenzuron - corresponding to 0.75 oz/acre (0.012 lb/A) rather than the upper end of the application rate that corresponds to 1 oz/acre (0.016 lb/A) which is a rate often specified in contracts.
- The APHIS aerial AgDISP analysis was conducted with a VMD of 137.5, far larger than those predicted for other ULV analyses. APHIS never explains exactly why.
- The number of flight lines are not specified in the input, yet according to the AgDrift user guide, *"the application area (swath width multiplied by the number of flight lines) can potentially have a major impact"* on drift (Teske et al. 2003).
- APHIS Program operational guidelines (included as an appendix in the EA) do not specify any minimum or maximum droplet size therefore it is unknown what nozzles are actually being used and what droplet sizes are actually being emitted.

In conclusion, APHIS has not presented evidence that its RAATs method, even with skipped swaths 200 feet, will "provide additional benefits" or significantly increase the survival of pollinators or other beneficials within the treated blocks. Given the enormous size of many treated blocks (a minimum size for treatment is typically 10,000 acres, while treatment blocks of 100,000-150,000 acres are not uncommon in some states) and the limited mobility and small home ranges of many terrestrial invertebrates, it is essential that AHIS conduct a rigorous assessment of drift into untreated swaths and compare that to toxicity endpoints for representative species.

**Response:** The commenter is correct that APHIS believes the use of RAATs mitigates the risk to non-target insects including pollinators. However, APHIS does not solely rely on the reduced deposition of pesticides in the untreated swaths to determine the potential harm of grasshopper treatments will not cause significant impacts. The environmental consequences risk analysis of carbaryl and diflubenzuron treatments using conventional methods (total area coverage and higher application rates) is provided on pages 16-22 of the 2021 EAs. Additional descriptions of APHIS' analysis methods and discussion of the toxicology can be found in the 2019 EIS.

The commenter has expressed concern that APHIS' analysis modelling drift does not use the same variables values as similar analysis conducted by the US EPA. APHIS must explain that the EPA analysis is for general use of ULV pesticides while APHIS' analysis is based on multiple conservative estimations of operational procedures and variables for the grasshopper program. The commenter also cites a study (Schleier et al., 2012) and asserts the insecticide drift modelled and measured by the authors for ultra-low volume mosquito treatments are representative of the potential drift between treated and untreated swaths during a grasshopper suppression treatment using the RAATs method. APHIS disagrees with the commenter's understanding of the study based on the text of the article that states, "Ground-based ULV applications used for adult mosquito management are very different than agricultural pesticide applications because the nozzles produce an aerosol (droplets < 100 μm) and are pointed at a + 45° angle from the horizon. Ultra-low-volume applications used for adult mosquito management are most effective when the insecticide remains airborne and moves through the target area; in contrast, applications for agricultural pests are designed to minimize the movement of droplets (Hiscox et al., 2006)."

The commenter appreciates the graphical representation of spray drift provided by APHIS for the purpose of estimating pesticide deposition at various distances from the treated swath. The graphs are intended to explain how APHIS derived no-treatment distances for buffers intended to prevent harm to species protected by the Endangered Species Act. APHIS does not assert that spray drift is reduced to zero in untreated swaths, and that is not represented by the graphs or assumed by the risk analysis cited by the commenter (APHIS EAs, EIS, HHERAs). If the commenter agrees the graphs are reasonable representations of spray drift, and wishes to extrapolate the modeling to deposition resulting from APHIS' use of the RAATs method, the exponential drop of pesticide deposition close to the release point is more informative.

Wyoming typically uses category C or D aircraft for treatments with swath widths varying between 100 feet to 150 feet depending on type of aircraft. Wyoming prefers to utilize APHIS RAATs strategy with 50% skip. Wyoming follows programmatic EIS and drift modeling to further mitigate drift and protect non targets. The minimum swath width for treatments has been described in the EA's for 2020 and 2021. The swath width has been described in detail in the above discussion. This again was described in the 2020 EA, please see comments, 10, 12, 14, 19, 20, 21, 23, 24, 25, 28, 41 of the 2020 EA.

8. **The EA understates the risks of the insecticides diflubenzuron and carbaryl for exposed bees and other invertebrates.**

The single action alternative identifies three insecticide options (liquid diflubenzuron and carbaryl bait or liquid and liquid malathion), and states that the choice of which to use will be site-specific, without being clear about how that choice of insecticide is made. Still, according to the EIS, diflubenzuron was used on 93% of all acres treated between 2006 and 2017 and the Program used malathion only once since 2006. In addition, the EA indicates that ground treatments may occur, but the EIS states "In most years, the Program uses aircraft to apply insecticide treatments." If past is prologue, then we can expect that a majority of treatments that will occur under this EA will be with diflubenzuron (Dimilin 2L; EPA Reg. No. 400-461) applied via aircraft.

The EA gives almost no actual information on how either of these two chemicals will impact bees in the sprayed swaths, in the unsprayed swaths, or beyond the treatment block. This is unfortunate, as pollinators, including bumble bee species within the range of potential treatments, are facing significant declines (National Research Council 2007; Cameron et al. 2011).

*Diflubenzuron:* Diflubenzuron is an insect growth regulator and functions by disrupting synthesis of chitin, a molecule necessary to the formation of an insect's cuticle or outer shell. An insect larva or nymph exposed to diflubenzuron is unable to successfully molt and thus dies. Chitin is not limited to insect cuticles, but is also, for example, a component of mollusk radula, fish scales and fungi cell walls.

While insect growth regulators are often considered "selective", pollinators such as native bees and butterflies have no inherent protection against diflubenzuron and immatures are vulnerable to injury and death if exposed.

The risk assessment included for diflubenzuron (attached to the 2019 EIS) makes little to no mention of an important attribute of this insect growth regulator that EPA (in its 2018 Ecological Risk Assessment) does point out. Namely that tests run according to standardized adult testing guidelines may mask effects: *"Chitin synthesis is particularly important in the early life stages of insects, as they molt and form a new exoskeleton in various growth stages. Thus, aquatic guideline tests, (or terrestrial invertebrate acute tests), which typically run for 48 hours, may not capture a molting stage, and thus underrepresent acute toxicity. Single doses may cause mortality, if received at a vulnerable time. Consequently, conclusions from RQs based on acute toxicity studies for invertebrates may not fully represent actual risk."*

Given its toxicity to juveniles, rather than adults, the relevant laboratory toxicity data that should be reported by APHIS in the EA for its analysis of effects is larval toxicity data. However, while the EA discloses that diflubenzuron would result in greater activity on immatures, APHIS leaves out key information, such as the expected environmental concentration (EEC) from application, and how those concentrations compare to toxicity levels for immatures. After all, for bees, pollen collected by adults during breeding season (which coincides, for many species, with grasshopper spray windows) will mean exposure to developing larvae of bees, who may consume contaminated pollen placed in the nest by adults.

We could not find such an analysis in the APHIS EA or EIS, so we turned elsewhere to figure out this relevant information. There is a standard tool, known as Bee Rex, that calculates EECs from deposition to pollen and/or nectar, based on application rate (USEPA 2017). Bee Rex also allows for a comparison between the estimated environmental concentration and the acute or sublethal toxic endpoint for honey bee adults and/or larvae. For honey bees (the surrogate species for invertebrate risk assessment in the absence of other data), USEPA (2018) reported a chronic 8-day larval LD50 of 0.044 ug ai/larvae and NOAEL of 0.0064 µg a.i./larva.

Using these values, we conducted an assessment of the potential acute and chronic dietary risk to bee larvae. We utilized deposition values assuming no drift under both the full and reduced rates as specified in the EA (0.75 or 1.0 fluid ounce per acre (0.012-0.016 lb a.i./ac)). We also utilized deposition values using the point zero and point 500 feet[3] analyses presented in the APHIS drift analysis included in its BA to NMFS as mentioned above. Table 1 shows the outputs with Expected Environmental Concentrations and Risk Quotients, as calculated by the Bee Rex tool.[4]

(Footnote 3: Since we could not deduce an actual value for a 100-foot or 200-foot deposition rate, we used the deposition rate at 500 feet from the APHIS BA to NMFS. This would be a low end estimate since it's 2.5-5X further than the furthest edge of an unsprayed swath.)

(Footnote 4: APHIS presents no information in the EA that indicates the EECs would be any less than this, therefore these values are assumed to be the appropriate EECs at the specified deposition rates.)

**Table 1. DIFLUBENZURON Bee Risk Assessment**

| Application Rate (lb ai/A) | Scenario | Pollen/nectar EEC (mg/kg) | Pollen/nectar EEC (ppb) | Larval RQ Chronic dietary | Number of times LOC (Larval) |
|---|---|---|---|---|---|
| 0.16 | Full | 1.76 | 1760 | 18.1 | 18 |
| 0.12 | RAATS | 1.32 | 1320 | 13.6 | 14 |
| 0.009 | pt. zero APHIS drift analysis in 2010 BA | 0.981 | 981 | 10.1 | 10 |
| 0.0078 | pt. 500 APHIS drift analysis in 2010 BA | 0.858 | 858 | 8.8 | 9 |

* In Bee Rex, EPA translates any mortality effect into an acute RQ value. In this case, the concentrations that resulted in mortality were reported as an 8-day LD50 (most acute studies are based on one-time or brief exposures).

An acute risk quotient (RQ) of 1.0 (or higher) indicates that the estimated environmental concentration is sufficient to kill 50% (or more) of exposed bees. The Level of Concern (LOC) is an interpretation of the RQ. Normally the LOC is established at RQ=1.0. However, for acute risk to bees, because of bees' great ecological and agricultural importance, combined with concern about the risks posed to them by pesticides, EPA sets the LOC value at RQ=0.4. Using the deposition estimates above, larval acute RQs range from 2.4 – 4.9 (6-12X the EPA LOC threshold), depending on the scenario examined.

Chronic risk to bees is evaluated with an LOC at RQ=1.0 (USEPA 2014). As indicated in Table 1, even at 500 feet from the application site, using APHIS predictions for deposition, chronic RQ is estimated at 16.6. At the release site, assuming drift, the chronic RQ is estimated to be 19.1, assuming no drift it would be 34 at the full rate. RQs are thus 17-34X the EPA LOC level.

Risk quotients this many times the LOC values indicate a potential for mortality and chronic harm to exposed bee larvae.

APHIS appeared to acknowledge the risk to bees in many of the 2020 EAs by instituting a 4-mile buffer around any known managed leafcutter or alkali managed bees and by including notification to all apiarists before a treatment. However, APHIS in 2021 left this buffer out of the standardized treatment guidelines and shrugs off the risk of diflubenzuron to pollinators in the EA as follows:

> *Based on the review of laboratory and field toxicity data for terrestrial invertebrates, applications of diflubenzuron are expected to have minimal risk to pollinators of terrestrial plants.*

Due to the infeasibility of testing every known species for sensitivity to pesticides, EPA recognizes honey bees as the surrogates for the hundreds of native bees that may be present in the treated areas.

However, using surrogates requires a recognition of the limitations of this approach. Most native bees lead a solitary lifestyle and their larvae consume unprocessed pollen, and thus native bees may be more at risk than honey bees from equivalent levels of contamination in the environment.

In fact, in examining a study of bumble bees and diflubenzuron, APHIS cites Mommaerts et al. (2006), noting that reproductive effects were observed on bumble bees in this study, but claiming that these effects were observed at much higher use rates than those used in the program. Unfortunately, this is incorrect. Mommaerts et al. (2006) conducted dose-response assays and found that exposure to diflubenzuron resulted in reproductive effects in Bombus terrestris, with only the doses at 0.001 (one thousandth) of maximum field recommended concentrations (MFRC) in pollen and 0.0001 (one ten thousandth) in sugar water resulting in effects statistically similar to controls. The MFRC for diflubenzuron is listed in the study as 288 mg/L (equivalent to 288,000 ppb). At 1/10,000 of this level, diflubenzuron effects would be similar to controls only at levels at or below 28.8 ppb while at 1/1000 of this level, diflubenzuron "no effect" concentrations would be equivalent to 288 ppb.

Recall that the EECs for diflubenzuron under the program are expected to range from 1320 ppb to 1760 ppb as shown in Table 1 (RAATs rate, full rate, respectively). The Mommaerts study thus shows the opposite of what APHIS claims – that reproductive effects for bumblebees would be expected at the EECs expected for grasshopper suppression, even at the lower rate anticipated to be used under RAATS and even at 500 feet away. This raises concern that the application of diflubenzuron at the specified RAATS rates may cause severe (and incorrectly dismissed) impacts to bumble bee reproduction within treated areas.

Moreover, APHIS points out that the alfalfa leafcutting bee (*Megachile rotundata*) and the alkali bee (*Nomia melanderi*) are both considered more susceptible than honey bees or Bombus to diflubenzuron. Additionally, the EIS discloses that under some circumstances, Dimilin may be quite persistent; field dissipation studies in California citrus and Oregon apple orchards reported half-live values of 68.2 to 78 days. Rangeland persistence is unfortunately not available, but diflubenzuron applied to plants remains adsorbed to leaf surfaces for several weeks.

Lepidoptera also pollinate, if incidentally. Adults consume nectar while larvae eat leaf tissue. Lepidopteran larvae are not relatively protected in nests while developing (like bees are) but are fully exposed to the elements.

While studies of diflubenzuron effects to non-pest lepidopteran species can be hard to find, several studies of this chemical on pest species are identified in Eisler (1992). Eisler identified the following concerning results from published studies:

- In studies on Gypsy moth, all larvae died when exposed at 100 ug/kg food (100 ppb)
- Cabbage moth (*M. brassicae*), 90% larvae died when exposed to 2200 ppb in spray (3rd instar)
- Large white butterfly (*P. brassicae*), 50% of larvae died at 390 ppb.

The results from the gypsy moth and large white butterfly studies were conducted with exposures expected from applications under this grasshopper suppression program, while the cabbage moth study utilized a rate slightly higher than what would be expected from a full rate application with no drift (Table 1).

These results, which were not identified in the EA when APHIS discussed risk to pollinators, lend additional urgency to the need for APHIS to seriously reconsider the effects of diflubenzuron on pollinators.

*Carbaryl:* According to EPA (2017b), carbaryl is considered highly toxic by contact means to the honey bee, with an acute adult contact LD50 of 1.1 ug/bee. The APHIS 2019 EA describes the oral LC50 value as 0.1 ug/bee.[5] Larval bee toxicity was not available from the APHIS 2019 EA.

(Footnote 5: Honey bee toxicity values for technical-grade carbaryl are used here since the APHIS EA did not include information on the toxicity of the formulated product that it uses.)

We conducted a similar analysis of risk to bees using the BeeRex tool, as described above. According to APHIS' HHERA (2019) for carbaryl, spray applications of the Sevin XLR Plus formulation applied at 16 or 8 fl. oz. per acre are equivalent to an application rate of 0.5 and 0.25 lb a.i./A , respectively. To assess drift, input values from the APHIS analysis presented in its 2010 BA to NFMS were inferred from the chart in that BA. Using an application rate of 0.375 lb ai/A, at point zero, deposition is predicted at 38 $mg/m^2$ (0.339 lb ai/A). At 500 feet, deposition is predicted at 21 $mg/m^2$ (0.187 lb ai/A).

| Table 2. Liquid CARBARYL Bee Risk Assessment | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Adult RQs | | Number of times LOC (Adult) | |
| Application Rate (lb ai/A) | Scenario | Pollen/nectar EEC (mg/kg) | Pollen/nectar EEC (ppb) | Acute dietary | Acute contact | Acute dietary | Acute Contact |
| 1 | Full | 110 | 110,000 | 321 | 2455 | 803 | 6138 |
| 0.5 | RAATS | 55 | 55,000 | 161 | 1227 | 403 | 3068 |
| 0.339 | pt. zero APHIS drift analysis in 2010 BA | 37.3 | 37,300 | 109 | 832 | 803 | 6138 |
| 0.187 | pt. 500 APHIS drift analysis in 2010 BA | 20.6 | 20,600 | 60 | 459 | 150 | 1148 |

Note that even at the deposition rate APHIS expects at 500 feet away from the spray line with a lower nominal application rate of 0.375 lb ai/acre (we have already noted that these predicted deposition rates could be underestimates at that distance, based on empirical data), APHIS woud exceed the acute toxicity Level of Concern designated by EPA by 150X. All of the other deposition values have similarly disturbing exceedences of EPA's acute dietary LOC, while contact exposure also shows potential to exceed the LOC. Nowhere within the EA or the EIS is this made clear.

Given the lack of disclosure and the unacceptably high acute risk quotients reached with these deposition rates, carbaryl spray is an unacceptable option.

A study by Abivardi et al. (1999) looked at the effect of carbaryl contact toxicity to recently emerged adult codling moths (*Cydia pomonella*), finding that at 187.5 ng/cm$^2$ (which is equivalent to 0.016 lb/ac—the same as the highest application rate under the grasshopper program), more than 70% of exposed male moths died within 24 hours, while these rates killed 30% of the females within 24 hours.

It is our understanding that baits as used in the grasshopper suppression program do not represent an exposure risk to bees since they do not pick it up deliberately. Therefore, carbaryl bait, while highly toxic to those insects that would ingest it, at least avoids some of the exposure concerns of carbaryl spray.

**Response:** Please see the APHIS responses to comments 10, 12, 14, 19, 20, 25, 28, and 41 in the 2020 EAs.

The commenter asserts the EA does not provide information on the possible effects of diflubenzuron and carbaryl sprays on bees and pollinators. That information is provided on pages 22 and 25-26. The Draft EA is tiered to more extensive analysis in the 2019 EIS (page 45-46 and 55-57) and the HHERAs for Carbaryl (page 21 and 44) and Diflubenzuron (pages 13-14, 29-30) that addresses risk to pollinators including bees and their larval stages.

The commenter's risk quotient (RQ) analysis compares their calculated estimated environmental concentration (EEC, from the BeeREX Tier 1 risk screening tool) to the dietary LC50 and NOAEL. The residues are based on T-REX, an EPA terrestrial plant residue model, that is used to estimate exposure to food items consumed by birds and mammals. In the case of BeeREX they use residues that would be expected from direct application onto long grass. These values would not be anticipated to occur on pollen. Additionally, nectar pesticide residues may be as much as an order of magnitude below levels that would occur on pollen (EFSA, 2017). The BeeREX model assumes that pesticide residues are equal in pollen and nectar. It is unclear how the commenter used effect concentrations expressed in mg/L (cited in the literature) to mg/kg which is not a direct conversion. APHIS invites them to share their modelling assumptions and inputs. APHIS notes that as is appropriate for a Tier 1 risk screening tool, BeeREX is very conservative method for estimating residues on pollen and nectar.

APHIS conducted a thorough risk analysis based on published toxicological studies for carbaryl and diflubenzuron and that analysis is provided in the HHERAs. The commenter asserts that APHIS incorrectly evaluated the exposure data presented in the Mommaerts et al. study of chitin synthesis inhibitors, including diflubenzuron. The researchers exposed bees via a contact application of 288 mg/L aqueous concentration which was topically applied to the dorsal thorax of each worker with a micropipette. Bumblebees also ingested orally sugar/water treated with the same concentration of diflubenzuron solution over a period of 11 weeks. Pollen was sprayed with the same concentration of diflubenzuron until saturation and then supplied to the nests. The bumble bees were not restricted in how much of these contaminated solutions they could consume.

APHIS's review of the study did not identify findings of effects caused by diflubenzuron at the concentrations represented above by the commenter, "Mommaerts et al. (2006) conducted dose response assays and found that exposure to diflubenzuron resulted in reproductive effects in *Bombus terrestris*, with only the doses at 0.001 (one thousandth) of maximum field recommended concentrations (MFRC) in pollen and 0.0001 (one ten thousandth) in sugar water resulting in effects statistically similar to controls." The researchers instead estimated mean $LC_{50}$ concentrations based on the chronic exposure routes described above. These were 25 mg a.i/L dermal contact, 0.32 mg a.i/L ingested sugar-water, and 0.95 mg a.i/L pollen. The researchers noted, "In practice, bumblebees will rarely be exposed to such high concentrations, but these experiments have been undertaken to evaluate with certainty the safety and compatibility of compounds with bumblebees." They elaborated, "the present authors agree that, before making final conclusions, it is necessary that the laboratory-based results are validated with risk assessments for these insecticides in field related conditions."

APHIS believes conversion and comparison of program applied foliar spray rates to the concentrations of the solutions applied in this study would rely on unrealistic exposure scenarios. An exposure scenario where pollinators are exposed continuously for 11-weeks is not expected to occur in the APHIS grasshopper and Mormon cricket suppression program. In field applications diflubenzuron levels would decline over the 11-week exposure period due to degradation, flowering plants that have diflubenzuron residues would no longer be available for foraging by pollinators as flowers naturally die and do not provide pollen and nectar, and other plants would bloom after application without residues of diflubenzuron.

APHIS recognizes that there may be exposure and risk to some pollinators at certain times of the application season from liquid insecticide applications used to control grasshopper and Mormon cricket populations. APHIS reduces the exposure and risk to pollinators by using rates well below those labeled for use by EPA. Current labeling for grasshopper treatments also allows multiple applications per season. APHIS uses one application per season further reducing the risk to pollinators when compared to the current number of applications that can be made in a year to rangeland.

9. **APHIS never analyzes the possibility that its suppression effort may actually worsen future outbreaks of grasshoppers.**

Prior to chemical suppression of grasshoppers in the Americas, grasshoppers were regulated primarily by natural processes, including natural enemies such as birds, predatory insects, diseases, and even competition with other grasshoppers.

Chemical suppression of grasshoppers runs the very real risk of disrupting these important natural regulation processes, potentially setting the stage for worsened outbreaks in the future. This is not an idle thought – this possibility has explored by respected grasshopper researchers in a number of publications. For example, see Joern (2000) who discussed this information and concluded that large- scale grasshopper control may contribute to grasshopper problems. An analysis of adjoining Montana and Wyoming counties supported this analysis, showing that where large-scale chemical control was not regularly applied, acute problems rapidly disappeared and long intervening periods of low grasshopper density persisted. Conversely, in places where a history of control existed, chronic, long-term increases in grasshopper populations were observed (Lockwood et al. 1988).

Lockwood et al. (1996-2000) explored identified infested areas, their sizes and what happened to them in subsequent years. Data was presented for 15 untreated and 4 treated areas. Of these, only two untreated areas grew in size in their $2^{nd}$ year, and most winked out by the $2^{nd}$ year, not reappearing by the $3^{rd}$ year. This is powerful evidence that not treating is a viable decision, or that treating is not warranted in the first year, at least for small infestations, and at least if the goal is to minimize the chance that an outbreak/hotspot would result in something worse in the following year.

APHIS rationalizes its program, often stretching science to the point beyond where it is credible. For example, APHIS cites a study by Catangui et al. (1996-2000) which investigated the effects of Dimilin on non-target arthropods at concentrations similar to those used in the rangeland grasshopper suppression program. In APHIS' characterization, the study showed that treatment with Dimilin should be of no concern since applications resulted in "minimal impact on ants, spiders, predatory and scavanger beetles." However, APHIS does not disclose that the plots studied by Catangui measured only 40 acres. This is a far cry from the ground treatments normally measuring thousands of acres or the aerial treatments measuring a minimum of ten thousand acres that are seen in the actual grasshopper suppression program. Small treated plots of 40 acres can be quickly recolonized from the edges. Large treated plots are quite a different story.

Quinn et al. (1993) examined the co-occurrence of nontarget arthropods with specific grasshopper nymphal and adult stages and densities. The study reported that nymphs of most dominant grasshopper species were associated with Carabidae, Lycosidae, Sphecidae and Asilidae, all groups known to prey on grasshoppers. The authors state that "*the results suggest that insecticides applied to rangeland when most grasshoppers are middle to late instars*[6] *will have a* ***maximum impact on nontarget arthropods****."* [Emphasis added]

(Footnote 6: Note that applying during this developmental stage is a necessity with the use of chitin-inhibiting insect growth regulators such as diflubenzuron.)

Large scale treatment effects on ground beetles were investigated by Quinn et al. 1991. While this study was more akin to real-life treatments in the design, and found that initial large effects on ground beetles had disappeared by the 2nd year, this study did not investigate diflubenzuron, only malathion, carbaryl bait. The authors also state that *"the lack of a carryover effect in the second year is most likely due to the timing of grasshopper control treatments…adult ground beetles probably were very active several weeks before the treatment date and may have already reproduced before treatments were applied. Insects may also have immigrated into the evaluation plots after treatment."*

Since diflubenzuron would kill juvenile stages of insects and is more persistent than either malathion or carbaryl, it could have quite a different effect than these two chemicals. Therefore this study cannot be relied upon to insinuate that recovery would be similar to recovery under a carbaryl or malathion treatment.

Researchers even warned about the potential for treatments to worsen outbreaks in the Grasshopper IPM handbook. In Section IV.8 (Recognizing and Managing Potential Outbreak Conditions) Belovsky et al. cautioned:

> *"Pest managers need to consider more than the economic value of lost forage production or the outcry of individual ranchers. Grasshopper control might provide short-term relief but worsen future problems in these environments. From GHIPM findings (see VII.14), it appears that grasshopper populations in these environments have a high potential for being limited by natural enemies. Pesticide applications that reduce grasshopper numbers could also reduce natural enemy numbers directly by outright poisoning of the invertebrate natural enemies, or indirectly by lowering the numbers of vertebrate predators as their invertebrate prey are reduced. Therefore, the ultimate result of control efforts could be an increase in grasshopper numbers for the future, as they are released from the control of natural enemies."*

**Response:** The commenter again refers to comments addressed in the 2020 EA's, please see response to comments 21, 43 from the 2020 EA's.
The commenter assumes that there are widespread treatments in Wyoming. Of the roughly 52 million acres of rangeland in Wyoming, APHIS treated 340,664 acres with 50% RAATs in 2020 and 137,182 acres treated with 50% RAATs in 2019. This is roughly 0.0065% and 0.0026%, respectively, of Wyoming rangeland treated by APHIS in 2020 and 2019 utilizing the RAATs method. The commenter assumes APHIS will treat when requested. There have been seasons when the land managers have requested treatments, but because the populations did not merit treatments no treatments have occurred. The commenter failed to provide the methodology used

in the research cited. Also, the commenter failed to describe if the outbreaks were gradient or eruptive in the research cited. Berryman (2008) describes in detail the population dynamics of these two types of outbreaks and methods to address these types of outbreaks. The commenter must understand that outbreaks reoccur to some degree due to favorable ecological factors and grasshopper populations respond. Consequently, grasshopper treatments may reoccur in the same vicinity. The research cited did not indicate if RAATs methodology was used or not used during that research period of time.

**10. APHIS fails to meaningfully analyze the risk to grassland birds, many of which are declining.**

McAtee (1953) examined 40,000 bird stomachs and reported that >200 spp prey on grasshoppers. Such avian predators of grasshoppers include species often seen in Western areas, such as kestrel, and meadowlark. Avian predators of grasshoppers also include grassland birds in decline, that merit special consideration, including sage-grouse, Swainson's hawk, long-billed curlew, sage thrasher, and others.

According to McEwen (1987), grasshoppers are especially important for the raising of young by the majority of bird species. McEwen et al. (1996) cites a number of resources in stating that bird predation commonly reduces grasshopper densities on rangeland by 30-50 percent.

Despite this strong linkage between grasshoppers and the health of rangeland bird communities, APHIS only analyzes in very general terms the direct and indirect toxic effects of insecticidal treatments to birds, and fails to analyze the specific effects to the many declining bird species.

We appreciate that the Wyoming EA does reference the state SGCN list for birds, and discloses that they could be negatively affected, as well as listing species that consume large amount of grasshoppers. The Wyoming EA also includes some information about sage grouse and discloses that RAATS treatments of grasshoppers or Mormon crickets are exempted from the governor's executive order. The EA concludes that sage grouse would be unlikely to be directly affected by diflubenzuron and that indirect effects due to impacts to the prey base would be "reduced" through use of RAATS. However, the extent and effectiveness of this reduced impact is not clear. Based on the drift information we have seen and presented elsewhere in this comment letter, and the likelihood of at least short-term effects to the prey base that is documented in a variety of studies, we question the conclusion that RAATs treatments with diflubenzuron within sage grouse areas would not be likely to have a significant impact.

A recent study estimated a net loss of nearly 3 billion birds since 1970, or 29% of 1970 abundance in North America (Rosenberg et al. 2019). It is critical to recognize that grassland birds—an important group of species that extends well beyond the iconic sage grouse—have suffered the largest decline (53%) among habitat-based groups since 1970, while populations of six species of grassland birds have declined by 65-94%. This is never disclosed in the EA nor considered in the cumulative effects analysis.

Habitat loss is a huge driver of declines, yet pesticides still play a role (Hill et al. 2013), especially if their prey is affected. Birds are themselves 'free' insect control as described above (also see Bock et al. 1992), hence negative effects for birds could actually increase insect pests.

**Response:** The commenter assumes that there are widespread treatments in Wyoming. Of the roughly 52 million acres of rangeland in Wyoming, APHIS treated 340,664 acres with 50% RAATs in 2020 and 137,182 acres treated with 50% RAATs in 2019. This is roughly 0.0065% and 0.0026%, respectively, of Wyoming rangeland treated by APHIS in 2020 and 2019 utilizing the RAATs method. Birds are highly motive predators and will search for prey in areas with the treatment blocks where APHIS does not spray pesticides. For example, the skip swaths where the RAATs method is employed or within protective buffers established around water resources or other sensitive sites.

BLM, APHIS, NDA, NDOW, and USFWS operate under a Memorandum of Understanding when treating near sage grouse habitat. The outlined mitigation measures in the MOU are put into place to minimize the impacts to foraging leks which utilize grasshopper and Mormon crickets in their diets.

**11. It is unrealistic to assume that APHIS can comply with mitigation measures designed to protect bees on pesticide labels.**

APHIS claims that it will adhere to applicable mitigations designed to protect bees that are found on product labels. For example, the Final EIS categorically states that *"Product use restrictions and suggestions to protect bees appear on US EPA approved product labels and are followed by the grasshopper program. Mitigations such as not applying to rangeland when plants visited by bees are in bloom, notifying beekeepers within 1 mile of treatment areas at least 48 hours before product is applied, limiting application times to within 2 hours of sunrise or sunset when bees are least active, appear on product labels such as Sevin® XLR Plus. Similar use restrictions and recommendations do not appear on bait labels because risks to bees are reduced. APHIS would adhere to any applicable mitigations that appear on product labels."*

It should be remembered that bumble bees fly earlier and later in the day than honey bees and limiting application times to within 2 hours of sunrise or sunset may not be protective. In addition, while diflubenzuron is toxic to larval and developing forms of numerous insects, it appears that Lepidoptera (butterflies and moths, many of which are at-risk as emphasized in Xerces' comment letter from 2020) are more sensitive to diflubenzuron, as a group, than most other taxa (Eisler 1992).

The Dimilin 2L label instructs the user to "minimize exposure of the product to bees" and to "minimize drift of this product on to beehives or to off-site pollinator attractive habitat." The Sevin XLR Plus label instructs applicators: "Do not apply this product to target crops or weeds in bloom."

However, if treated habitat is flowering and bees are active (as would be anticipated during any of the proposed treatment months), it is not clear how applications for grasshopper/Mormon cricket control can avoid blooming plants in the treated areas or minimize exposure to bees.

Except for reduced rates and/or untreated swath widths, the EA is silent on how it will avoid impact to pollinators. It has already been shown that within sprayed areas, risk quotients at expected application rates would be well above 1.0. Leaving skipped widths is also not a full solution at expected widths since, due to drift, untreated swaths are highly likely to be exposed to levels above risk quotients (see above comment).

In cropland areas, applicators sometimes minimize exposure to bees by applying at night. From examination of some of the flight records from past grasshopper treatments, it is clear that this is not the norm for the program, at for aerial treatments.

**Response:** The commenter made similar comments addressed in the 2020 EA's. Please see the APHIS responses to comments 10, 12, 14, 19, 20, 25, 28 and 37 in the 2020 EA's.
The commenter is correct that APHIS believes the use of RAATs mitigates the risk to non-target insects including pollinators and bees. APHIS does not believe the adherence to product use restrictions mitigates all harm to these species. Instead APHIS has analyzed the benefits of relatively small grasshopper treatments against the potential for significant impacts to bee populations within the large area covered by the EAs. The environmental consequences risk analysis of carbaryl and diflubenzuron treatments is provided on pages 16-22 of the 2021 EAs. Additional descriptions of APHIS' analysis methods and discussion of the toxicology can be found in the 2019 EIS.

**12. Listed species analysis rests on shaky ground.**

According to the EA, programmatic consultation with the US Fish and Wildlife Service on species listed under the Endangered Species Act was initiated in 2015, but is not yet complete. The backup is for APHIS to consult at the local level.

The EA includes *Appendix 3: Summary of Species Determinations and Impact Mitigation Measures* which describes listed species and critical habitat, and provides determinations pursuant to consultation. We appreciate the inclusion of APHIS determinations and reasoning in the Wyoming EA (many other states did include such information and it is important that the public be aware of such determinations and the reasoning behind them).

In some of the determinations, it is unclear what APHIS' determination is to critical habitat (i.e. see Western Glacier Stonefly).

In several cases, the depth of the reasoning is scant, and or sufficiently incomplete as to be inaccurate or even misleading. For example, we believe the reasoning for behind the determination for Blowout Penstemon, Ute Ladies' Tresses, and Desert Yellowhead, all listed flowering species, is faulty. For example, the following reasoning is provided for these species: *"No buffer is required for diflubenzuron as they have no effect on adult insect pollinators."* The fact that diflubenzuron impacts juvenile bees, which can be exposed through the food provided to them if plants are blooming at the time of application, is not mentioned. Impacts to juveniles have the potential to affect subsequent populations, a paramount consideration for listed and declining species.

In another case, a more detailed analysis is presented for the Yellow-billed Cuckoo, which includes, among other studies cited, a summary of a study by Tingle (1996). The APHIS summary says that only two taxonomic groupings were affected out of 28. In fact, the Tingle study discloses the following:

- analysis of effects was only done on most common taxa at family or order level and that in many cases invertebrates occurred in numbers too small to evaluate statistically.
- Tingle also reported evidence of possible effects on spiders and heteropteran bugs within barriers, lasting over 3 mo and that the relative abundance of both caterpillars [Lepidoptera] and non-target grasshoppers [Acrididae] declined within spray barriers following treatment and remained low for several months. Data from 1994 showed a severe negative impact on lepidopteran larvae within barriers lasting > 3 months.
- The author concluded that adverse impacts on spiders [Araneae] (particularly Salticidae), crickets [Orthoptera; Gryllidae] and bugs [Heteroptera] could not be discounted.

Listed species' protected locations must be mapped out for ground and aerial applicators, including all buffer widths listed in the protective measures, and any specific instructions (i.e. use of carbaryl bait only) for some species.

**Response:** APHIS appreciates the commenter's careful review of the protected species lists provided in the Draft EA. APHIS has provided the most current ESA consultation documents in Appendix 2 in the Final EA for the 2021 treatment season. The commenter's concern that treatment applicators could be confused by vague descriptions of the protection measures in the EA is misplaced. APHIS prepares detailed maps of treatment blocks that include no-spray buffers and other operational details (I.e. no fly zones) for applicators. APHIS agrees that without concurrence from the services on the findings of our consultation the potential for significant impacts will not have been fully evaluated in the final EA and FONSI. However, the agency's compliance with the Endangered Species Act follows a different timeline from the preparation of our NEPA documents. In accordance with APHIS' NEPA implementing regulations the agency may determine the FONSI is contingent on completion of ongoing ESA consultations. See also comments 29, 31 and APHIS' responses in the 2020 EA's.

**13. Within the last year, the monarch butterfly has been designated a candidate species under the Endangered Species Act, but the EA contains no information about impacts to or consultation for this species.**

No information is available in the EAs about the potential for effects to the monarch butterfly, recently designated a Candidate species under the Endangered Species Act. On December 15, 2020, the U.S. Fish and Wildlife Service announced that listing the monarch butterfly under the Endangered Species Act is warranted, but precluded by other priorities, making the monarch a candidate species. US Fish and Wildlife Service normally does consult on candidate species and instructs project leads to consider candidates in effects analysis. Therefore it appears to be an oversight that monarchs have not been included. APHIS must address the oversight and analyze impact to the monarch under the alternatives prior to implementing the action alternative.

In 2016 and 2017, the U.S. Department of Agriculture National Resources Conservation Service's (NRCS) developed regional Monarch Butterfly Wildlife Habitat Evaluation Guides, and discouraged placement of monarch breeding habitat within 38 m (125 ft.) of crop fields treated with herbicides or insecticides (NRCS 2016).

The risk of carbaryl applications may be unacceptably high for lepidoptera, including the monarch, based on data from Abivardi et al. (1999) as explained earlier in this comment letter. In addition, lepidopteran species are often quite sensitive to diflubenzuron, as documented elsewhere in this comment letter, therefore, impacts to this highly diminished species from diflubenzuron should be specifically analyzed.

**Response:** The Monarch butterfly was listed as a candidate species on December 15, 2020. The U.S. Fish and Wildlife Service's (USFWS) 12-month status review determined that it was "warranted but precluded". The Endangered Species Act (ESA) provides for a "warranted-but-precluded" finding when the Service does not have enough resources to complete the listing process, because the agency must first focus on higher-priority listing rules. "Warranted-but-precluded" findings require subsequent review each year until the USFWS undertakes a proposal or makes a not-warranted finding. APHIS is not required by ESA Section 7 consultations to consult on species that have been precluded from being listed as threatened and endangered (T&E) species.

The 2021 USFWS official species list for these Environmental Assessments (EAs) (WY-21-01) covering the rangeland action areas for ESA Section 7 consultations with U.S. Fish and Wildlife Service, covered consultations on species from this official list. The USFWS does not give concurrence for candidate species.

The commenter cited an article by the USDA - National Resource Conservation Service (NRCS) (2016) for Monarch Butterfly Wildlife Habitat Evaluation Guides, but these guides deal with crop lands not rangelands. According to (USDA NCRS (2020), the NRCS agency's primary geographic focus for monarch habitat has been in Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Ohio, Oklahoma, Texas, and Wisconsin, the primary eastern monarch migration corridor in a 10-state area of the central United States (USDA NRCS,. 2020).

On August 26, 2014, a petition to protect the Monarch Butterfly under the ESA was submitted on behalf of the Center for Biological Diversity, Xerces Society, Center for Food Safety, and Dr. Lincoln Brower. In this petition under the factors and the justification listed ,"The ESA states that a species shall be determined to be endangered or threatened based on any one of five factors (16 U.S.C. § 1533 (a)(1)): 1) the present or threatened destruction, modification, or curtailment of its habitat or range; 2) overutilization for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) the inadequacy of existing regulatory mechanisms; and 5) other natural or manmade factors affecting its continued existence". The monarch is threatened by all five of these factors and thus warrants protection under the Act. The petition failed to describe in any manner, under the factors listed in the petition if any decline of milkweed populations occurred in rangeland habitats. All descriptions under the factors described dealt with decline of populations in cropland settings due to the heavy use of chemicals to control pests to crops. APHIS believes the types and amounts of chemicals being used in cropland settings are more varied and greater than chemicals being used in open rangeland settings where relatively rare grasshopper suppression treatments occur. The commenter did not provide data or justification to explain any decline in the amount of milkweed or if any milkweed is even present on rangelands was given.

Monarchs require milkweed for both oviposition and larval feeding. The correct phenology, or timing, of both monarchs and nectar plants and milkweed is important for monarch survival (USFWS, 2020). The ecological requirements of a healthy monarch population are summarized by Redford et al. (2011). In order to be self-sustaining, a population must be demographically, genetically, and physically healthy without the following ecological requirements sufficient seasonally and geographically specific quantity and quality of milkweed, breeding season nectar, migration nectar, and overwintering resources to support large healthy population sizes can occur.

Milkweed poisons cattle and other livestock. The toxic agents are cardiac glycosides. To be poisoned, cattle can eat as little as 1.0 percent of their body weight in broad-leafed milkweed; amounts as low as 0.15 percent have poisoned sheep and goats (Clayton, 2021). See also comment and response to comment 82 of the 2020 EAs.

**14. Carbaryl has been analyzed on listed species nationwide with widespread "likely to adversely affect" determinations –but no mention of this or mitigation for its harmful effects is found in the EA**.

The EA does not mention a recent nationwide consultation effort on carbaryl's effect to listed species. In its Biological Evaluation that it forwarded to the Services, EPA determined that carbaryl is likely to adversely affect nearly all listed species nationwide (see https://www.epa.gov/endangered- species/final-national-level-listed-species-biological-evaluation-carbaryl). Species in Wyoming that are likely to be adversely affected are not mentioned. In addition, the US Fish and Wildlife Service recently determined that malathion is likely to adversely affect the vast majority of listed species across the country.

Such determinations by EPA and the Services are cause for a high level of concern. At a minimum, one would expect to find disclosure of these determinations and inclusion of mitigation for carbaryl's and malathion's harmful effects to listed species. Instead, no mention is made.

**Response:** The commenter made the same comment in 2020, please see the APHIS responses to comment 17 in the 2020 EA's.

**15. Vulnerable pollinators and arthropods as a group are put at risk by the proposed action, despite widespread reports of insect decline and affirmative federal obligations for federal agencies put into place several years ago.**

The geographic area covered by this EA may be home to 600-900+ species of native bees (McKnight et al. 2018, Figure 1). Perhaps this is not surprising since the majority of rangeland plants require insect- mediated pollination. Native, solitary bee species are important pollinators on western rangeland. Hence, pollinators are important not only for their own sake but for the overall diversity and productivity of native rangelands, including listed plant species. However, this essential role that pollinators play in the conservation of native plant communities is given very short shrift in the EA.

Many of the pollinators that call Wyoming home are already considered at-risk. See lists of at risk pollinators found our comment letter submitted in 2020, (these comments are also attached to our 2021 email submitting this comment letter).

Unfortunately, pollinators are just a piece of a larger ominous development facing insects as a whole. Recent reports suggest that insects are experiencing a multicontinental crisis that is apparent as reductions in abundance, diversity, and biomass (Forister et al. 2019).

Despite this very real crisis in biodiversity, the EA does not disclose which, if any, invertebrates within the geographic area are listed as sensitive by federal land management agencies or as Species of Conservation Concern, or whether the state of Wyoming esignates any invertebrates as species of greatest conservation need.

APHIS stands to worsen the plight of pollinators and of insects as a group through implementation of its grasshopper suppression program as described in the EA. In particular, the status of at-risk native bees and at-risk native butterflies may worsen as a result of insecticide treatments for grasshopper control.

In addition, the EA makes no mention of the fact that there are affirmative obligations incumbent on federal agencies with regard to protection of pollinators, regardless of whether they are federally listed. Federal documents related to pollinator health include:

- the 2014 Presidential Memorandum -- Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators
- the National Strategy to Promote the Health of Honey Bees and Other Pollinators
- the Pollinator-Friendly BMPs for Federal Lands
- the Pollinator Research Action Plan

Under the Presidential Memorandum executive departments are directed as follows:

- Executive departments and agencies shall, as appropriate, take immediate measures to support pollinators during the 2014 growing season and thereafter. These measures may include planting pollinator-friendly vegetation and increasing flower diversity in plantings, limiting mowing practices, and avoiding the use of pesticides in sensitive pollinator habitats through integrated vegetation and pest management practices.

Under the Pollinator-Friendly BMPs for Federal Lands, federal agencies are directed to:

- Determine the types of pollinators in the project area and their vulnerability to pesticides, taking into consideration pesticide chemistry, toxicity, and mode of action. Consult local Cooperative Extension or state departments of agriculture for more information.
- Minimize the direct contact that pollinators might have with pesticides that can cause harm and the contact that they might have with vegetation sprayed with pesticides that are toxic to pollinators. Try to keep portions of pollinator habitat free of pesticide use.
- Plan timing and location of pesticide applications to avoid adverse effects on pollinator populations. Apply pesticides that are harmful to pollinators when pollinators are not active or when flowers are not present.

And the National Strategy to Promote the Health of Honey Bees and Other Pollinators includes as a one of three key goals:

- Restore or enhance 7 million acres of land for pollinators over the next 5 years through Federal actions and public-private partnerships.

**Response:** Please refer to the response for comment number 38 in the 2020 EAs as well as comments 5, 6, 8, 9, 10, and 11 above.
APHIS reduces the risk to native bees and pollinators through monitoring grasshopper and Mormon cricket populations and making pesticide applications in a manner that reduces the risk to this group of nontarget invertebrates. Monitoring grasshopper and Mormon cricket populations allows APHIS to determine if populations require treatment and to make treatments in a timely manner reducing pesticide use and emphasizing the use of Program insecticides that are not broad spectrum. Historical use of Program insecticides demonstrate that diflubenzuron is the preferred insecticide for use. Over 90% of the acreage treated by the Program has been with diflubenzuron. Diflubenzuron poses a reduced risk to native bees and pollinators compared to liquid carbaryl and malathion applications. In addition, APHIS used RAATs to treat approximately 99% of the acres historically treated by the Program. When using the RAATs method APHIS applies pesticides below the labeled rates further reducing the amount of insecticide used by the program. APHIS also emphasizes the use of carbaryl bait, where applicable, as a means to suppress pest populations while protecting native bees and pollinators. Grasshopper suppression treatments typically occur in the early morning when pollinators are less active. These methods of applications have been shown to mitigate harm to nontarget invertebrates.

**16. Freshwater mussels are at risk across the country and need particular attention.**

The Dimilin label indicates that the product is toxic to mollusks. The Sevin XLR Plus label indicates that the product is extremely toxic to aquatic invertebrates.

Nationally, more than 90 mussel species are federally listed as endangered and threatened, and more than 70% are thought to be in decline. About 32 species are thought to have already gone extinct. In the western U.S., populations of western pearlshell, California floater, and western ridged mussel are all in decline, especially in Arizona, California, Montana, and Utah.

The 2019 EIS includes an aquatic residue analysis but does not take the next risk assessment step of comparing its residue analysis to known toxicity endpoints for freshwater mussels or other aquatic invertebrates.

**Response:** The commenter made the same comment in the 2020 EAs. Please see APHIS response to comment 40 and 41 in the 2020 EAs.
All bodies of water are buffered according to APHIS Treatment guidelines and the protective measures agreed upon during the consultation process. If the land manager requests a greater buffer distance around water or other sensitive sites APHIS follows that request. APHIS believes the buffers for aquatic habitats are protective of the freshwater mussels the commenter has identified. Implementation of the proposed buffers along with the other mitigation measures will provide protection of mussel food items as well as any freshwater fish hosts that are required for transformation of glochidia to juvenile mussels.

**17. The EA is silent on buffers around stock tanks. These can be important reservoirs of biodiversity, even as they may be better known for being home to many non-native species.**

The EA does not identify any buffers that will be observed to prevent pesticide overspray or drift into these habitats. Studies of these habitats (Hale et al. 2014; Hasse and Best 2020) have shown that stock ponds/tanks are important surrogate habitats for native species, and can be equivalent to natural habitats in terms of total abundance and richness of aquatic invertebrates.

**Response:** Stock tanks are given the same buffer as any other surface water. The commenter gave the same comment in the 2020 EA's. Please refer to APHIS response to comment 43 of the 2020 EA's.

**18. APHIS includes no information about whether an NPDES permit has been obtained, and what provisions it includes.**

APHIS includes no information about whether an NPDES permit has been obtained, and what provisions it includes. As described on the Dimilin 2L label, diflubenzuron is susceptible to runoff, and could result in discharges to surface water. Under the Clean Water Act, discharges require permit coverage under the National Pollutant Discharge Elimination System. An NPDES permit may be required. Even if an NPDES isn't required for certain activities, APHIS still has a duty to comply with state water quality standards under the Clean Water Act. Further, an NPDES permit does not absolve the agency of its duty to disclose impacts to water quality under NEPA.

Aquatic impacts could occur weeks or months beyond the treatment period, given difluenzuron's persistence. It is not clear if environmental monitoring is conducted in such a way as to pick up delayed transfer of diflubenzuron to nearby waterways.

**Response:** APHIS complies with the Clean Water Act as administered by the Wyoming Department of Environmental Quality. An NPDES permit is required if pollutants are discharged from a point source into waters of the United States.

APHIS employs several mitigation measures intended to mitigate offsite transport of pesticides to sensitive habitats, including waterbodies. APHIS reduces the potential for drift and volatilization by not using ultra-low volume (ULV) sprays when the following conditions exist in the spray area:

- Wind velocity exceeds 10 miles per hour (unless state law requires lower windspeed)
- Rain is falling or is imminent
- Dew is present over large areas within the treatment block
- There is air turbulence that could affect the spray deposition

APHIS also does not apply insecticides directly to water bodies such as reservoirs, lakes, ponds, pools left by seasonal streams, springs, wetlands, and perennial streams and rivers. APHIS also follows all other label restrictions designed to protect aquatic habitats. Furthermore, APHIS uses the following buffers for water bodies:

- 500-foot buffer with aerial liquid insecticide
- 200-foot buffer with ground liquid insecticide
- 200-foot buffer with aerial bait
- 50-foot buffer with ground bait

**19. Special status lands**

The EA makes mention of the presence of various special status lands. However, there is no mention of impacts to or any specific protections to be accorded to special status lands such as Wilderness areas, Wilderness study areas, National Monuments or National Parks, Research Natural Areas, National Wildlife Refuges, and/or designated or proposed Areas of Critical Environmental Concern within potential treatment areas.

**Response:** The commenter gave the same comment in the 2020 EA's. Please refer to APHIS response to comment 49 of the 2020 EA's.

**20. Avoidance of Lands Where Organic or Transitioning Production Occurs**

The general treatment guidelines for 2021 state: "In areas considered for treatment, State-registered beekeepers and organic producers shall be notified in advance of proposed treatments. If necessary, non-treated buffer zones can be established."

We are concerned about the potential for drift and runoff to certified organic or transitioning lands. Certified organic farmers who receive drift, even if unintentional, would risk losing certification for three years. That would mean these producers would also lose any income from those acres, and they would then have to manage affected lands completely separately from other unaffected acres.

Organic producers place a large emphasis on improving biodiversity on their lands, per the National Organic Standard. Many organic farmers approach this by establishing or conserving permanent pollinator and native habitat – an effort that can take years.

The general guidelines, crafted for the program as a whole, and included in each state's EA, leave a number of questions about notification and avoidance of impacts to organic or transitioning producers, including:

- It is unclear if each state maintains a complete registry of organic and transitioning producers, and if that registry is spatially referenced. Many producers farm land in disparate locations. There are a number of certifying organizations across the west, not just the states. It is unclear if these different organizations share information, and if APHIS would be accessing a complete list in any locality.
- It is unclear what the notification process to organic and transitioning producers is. A public meeting is likely to not be sufficient. Given the short time frames between final treatment decisions and the fact that treatments usually occur in the early, critical part of the growing season, it also seems likely that some organic producers could completely miss a notification.
- APHIS appears to make the establishment of buffers optional. Given the issues we've outlined with notification, optional buffers are not a sufficient protection.

**Response:** APHIS only treats rangeland where the land manager or property owner has requested suppression of grasshopper infestations. APHIS employs several mitigation measures intended to mitigate offsite transport of pesticides outside the treatment block to adjacent cropland. APHIS reduces the potential for drift and volatilization by not using ultra-low volume (ULV) sprays when the following conditions exist in the spray area:

- Wind velocity exceeds 10 miles per hour (unless state law requires lower windspeed)
- Rain is falling or is imminent
- Dew is present over large areas within the treatment block
- There is air turbulence that could affect the spray deposition

APHIS prepares maps of the treatment area that exclude sensitive sites, such as organic crops from the treatment area. The Program also notifies residents within treatment areas, or their designated representatives prior to proposed treatments. Wyoming also sends notification letters of potential treatments to all beekeepers registered with Wyoming Department of Agriculture. They are advised of the control method to be used, proposed method of application, and precautions to be taken. If necessary, non-treated buffer zones are established to protect these resources. A buffer zone is a distance or space around a sensitive area that will not be sprayed to minimize harm and disturbance of that area.

**21. Extent of treatment to private lands**

Xerces has concerns about treatments on public lands, which have resource values above and beyond cattle forage that must be taken into account. The EA notes that APHIS will also take requests for treatment from private landowners. Xerces is also concerned about impacts to resources and species that overlap with private lands and the scope of APHIS's program, which is not supposed to be geared toward private lands.

**Response:** APHIS understands the commenter is concerned about grasshopper treatments on public and private lands. APHIS believes a more thorough examination of the EAs and EIS will reduce those concerns. The commenter is mistaken in their assertion that APHIS grasshopper treatments are not intended to occur on or benefit private lands. APHIS complies fully with the Endangered Species Act for all areas where treatments might occur. Those documents are included in the EA to alleviate public concerns.

**22. Cumulative effects analysis**

The EA does not adequately disclose the locations where spraying has occurred in the past, nor did the APHIS 2019 EIS.

In the EA, APHIS states that cumulative effects not expected to be significant, basing its reasoning on the assertion that the probability of an outbreak occurring in the same area as a previous outbreak is unlikely. APHIS does include the total acreage of area treated between 2010-2019 in Wyoming and we appreciate the inclusion of that data. However, APHIS does not disclose the locations of treatments in any of those years.

Based on our independent review, Wyoming's history of recent treatments does not support its statement that the probability of an outbreak occurring in the same area as a previous outbreak is slim. Wyoming in fact has treated large areas in close proximity, and even in overlapping areas in recent years, and it appears that large treatment areas have been the norm for many decades into the past, back to the 1950s at least (Lockwood et al. 1988). APHIS also places emphasis on the fact that its policy dictates that only one treatment a year is conducted, but does not address nearby impacts on private or state lands where more than one treatment may be conducted on rangeland or cropland, which could contribute to cumulative impacts. In addition, ecological impacts can be severe even if a repeat treatment is unlikely if treatment results in adverse effects to a species confined to a small range, already in decline, or both.

In addition, impacts to migratory species from cumulative exposures (such as honeybees which, as the EA discloses, are in large part transported to California during the almond bloom) are not addressed.

**Response:** APHIS addressed similar comments in the 2020 EA's. Please refer to APHIS responses to comments 85, 86, 87, 88, 89, 90, 91, of the 2020 EA's.
Cumulative impacts, as defined by the Council on Environmental Quality (CEQ), is "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR § 1508.7). Potential overlap of APHIS grasshopper suppression treatments are unlikely to result in significant cumulative impacts because the program applied pesticides are not persistent in the environment year to year. Grasshopper treatments conducted by state agencies or private land owners are unlikely to overlap where APHIS has conducted a treatment program. Potential environmental effects resulting from treatments conducted by other entities outside of APHIS treatment blocks will not contribute to potential cumulative significant impacts by APHIS as

defined by CEQ. APHIS provided a more thorough analysis of potential cumulative impacts in the 2019 EIS for the grasshopper program.

**23. For APHIS and its cooperative land management agencies, building resilience into the system should be the key goal.**

APHIS does not identify how it coordinates with land management agencies, such as the BLM, to address site-specific sensitive issues such as sage grouse, Resource Management Plan requirements, limitations on special status lands, etc. Due to the spatial specificity of such issues, the national MOUs simply cannot adequately address such concerns.

Unfortunately APHIS also makes no mention in the EA of what is most sorely needed: cooperation and planning with land managers to take appropriate steps to prevent the types of grasshopper and cricket outbreaks that are now dealt with by chemical controls. We believe that APHIS and its land management partners need to invest in longer-term strategic thinking regarding grasshopper management on Western rangelands. Building resilience into the system should be the key goal.

According to the Rangeland Management section of the Grasshopper IPM handbook, high diversity in canopy structure and plant species composition tends to support high diversity in grasshopper species and this diversity and composition tend to provide stability and to suppress pest species that exploit disturbance.

Emphasizing cultural techniques through appropriate grazing management could help to reduce reliance on pesticide applications and allow abiotic and biotic factors to regulate grasshopper and Mormon cricket populations to the greatest extent possible. For example Onsager (2000) found that (compared to season-long grazing) rotational grazing resulted in significantly less adult *Melanoplus sanguinipes* grasshoppers and significantly less damage to forage. Under rotational grazing, the nymphs developed significantly slower and their stage-specific survival rates were significantly lower and less variable. Consequently, significantly fewer adults were produced significantly later in the season under rotational grazing. Seasonal presence of all grasshopper species combined averaged 3.3X higher under season-long grazing than under rotational grazing. Local outbreaks that generated 18 and 27 adult grasshoppers per square meter under season-long grazing in 1997 and 1998, respectively, did not occur under rotational grazing. The outbreaks consumed 91% and 168%, respectively, as much forage as had been allocated for livestock, as opposed to 10% and 23%, respectively, under rotational grazing.

In addition, some research suggests that grasshoppers could be managed without insecticides by carefully timing fire and grazing to manage vegetation and reduce habitat suitability for target species (Capinera and Sechrist 1982; Welch et al. 1991; Fielding and Brusven 1995; O'Neill et al. 2003; Branson et al. 2006). While more research is needed to develop species- and region-specific management treatments that use alternatives to pesticides (Vermeire et al. 2004), there is likely enough data to employ cultural techniques now.

As described above (see item 8 in this comment letter), birds may consume 50% of grasshoppers on site. Ensuring healthy bird populations is critical for long-term grasshopper management.

Another argument for re-thinking the chemical-centric suppression program is that the costs of the program constrain APHIS' ability to respond to treatment requests. In addition, climate change poses a threat that may alter the frequency and locations of outbreaks.

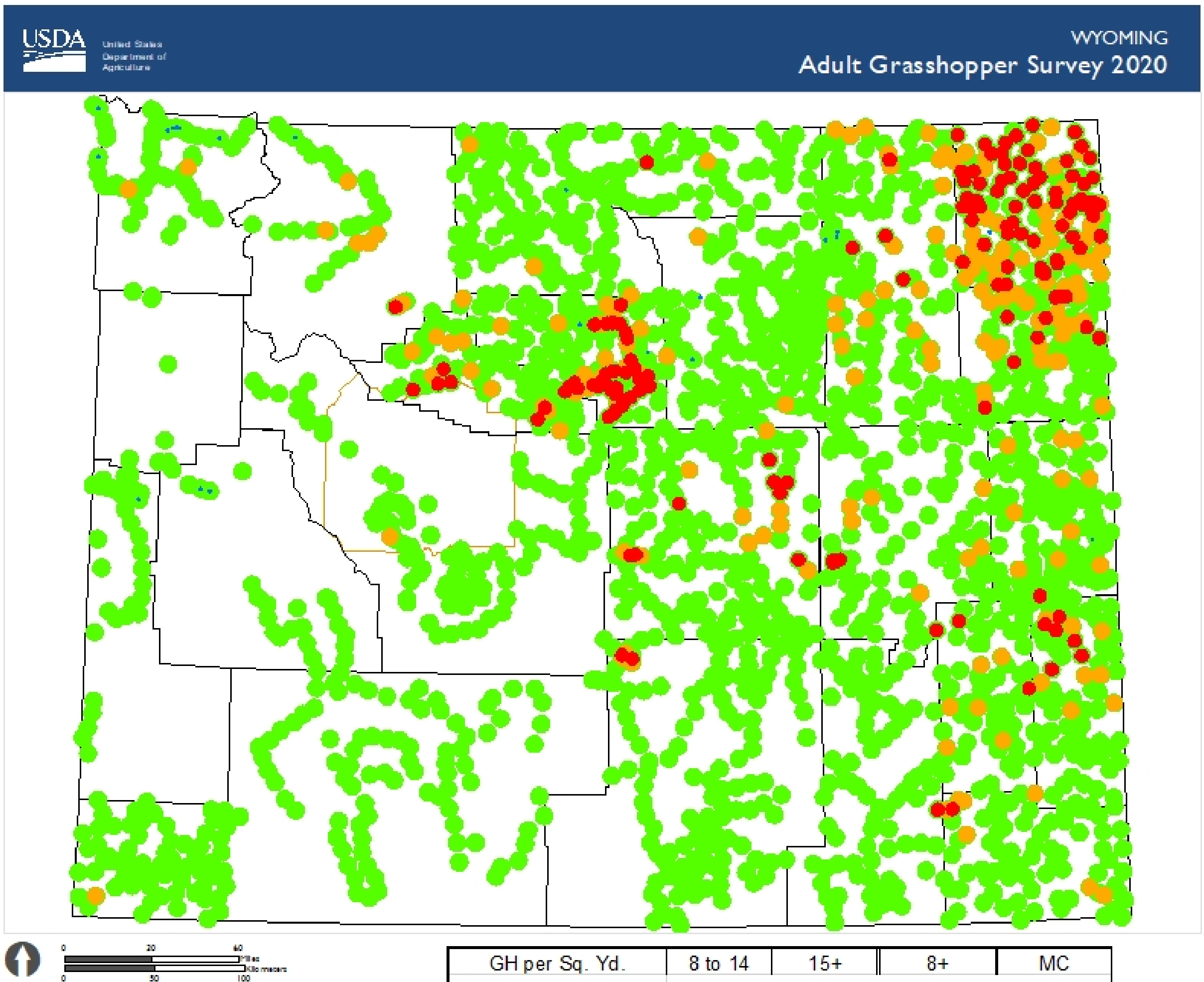
**Response:** The comments comparing rotational grazing to season long grazing are valid concerns. APHIS supports such management practices. However, the rotational grazing practices in Wyoming by the ranchers are not under the control of APHIS grasshopper program. Ranchers practice rotational grazing in Wyoming, APHIS only responds to the large outbreaks associated with the rangeland forage damage. Grazing practices are not under the control of APHIS. The research the commenter referenced concerning fire management, biological control, and other nonchemical methods are not valid control practices presently. Fire Management of rangeland is not controlled by APHIS. This method would have to be implemented by the land management agencies.

**24. Overall Transparency of the APHIS Grasshopper / Mormon Cricket Suppression Program Must Be Improved.**

We appreciate that public notice of this site-specific EA and its comment period was posted at the APHIS website. Grasshopper suppression efforts, especially those on federal lands, are of more than local concern. The action being proposed is a federal action, proposing to use federal taxpayer funds. The species of the United States, our natural heritage, do not observe ownership, county, tribal, or state boundaries. As such, APHIS should not claim that grasshopper suppression actions are only of local interest. All proposed grasshopper suppression actions and environmental documents should be noticed properly to stakeholders across the United States. The proper and accepted way of doing this is to publish notices and decisions in the Federal Register.

**Response:** The commenter gave the same comment in the 2020 EA's. Please refer to APHIS responses to comments 1, 2, 3, 52 and 55 of the 2020 EA's.

# Appendix 7: 2020 Adult Grasshopper Survey Map




**Grasshopper Density #/ Sq Yd**

- 15 +
- 8 - 14
- 1 - 7
- Mormon Cricket
- County Boundary
- WRIR Boundary

Buffer Radius

Green 3.25 miles
Orange 3.00 miles
Red 2.50 miles
Blue 0.75 miles

| GH per Sq. Yd. | 8 to 14 | 15+ | 8+ | MC |
|---|---|---|---|---|
| | Acres | | | |
| Private | 994,463 | 1,039,070 | 2,033,533 | 6,293 |
| BLM | 211,866 | 272,682 | 484,548 | 5,177 |
| State Lands | 92,541 | 134,101 | 226,642 | 2,045 |
| USFS | 87,996 | 38,521 | 126,517 | 4,563 |
| Wind River Indian Res. | 6,391 | 6,545 | 12,936 | 0 |
| Bureau of Reclamation | 14,454 | 2,455 | 16,909 | 0 |
| DOD | 3,136 | 320 | 3,456 | 0 |
| USFS, Grasslands | 9,272 | 7,523 | 16,795 | 0 |
| Bankhead Jones | 31,168 | 12,493 | 43,661 | 0 |
| National Park Service | 36,481 | 332 | 36,813 | 5,550 |
| Fish and Wildlife | 0 | 0 | 0 | 0 |
| Corps of Engineers | 0 | 0 | 1,000 | 0 |
| Total Acres Infested | 1,487,768 | 1,514,042 | 3,001,810 | 23,628 |

*This information is to be used by Land Managers and W&P Personnel in order to project possible outbreaks in spring of 2021. State wide 2,016 stops were surveyed between 7/1/2020 and 9/30/2020. Survey stops were collected by APHIS employees using the (18 sq. foot)/2 visual survey method. All data was collected as point data and displayed using a fixed buffer.*

USDA, APHIS, PPQ
5353 Yellowstone Road, Suite 208
Cheyenne, WY 82009

Data Source:
ESRI, PPQ

Date Created:
9/17/2020



Document Path: I:\Wyoming\Cheyenne\PROGRAMS\Grasshopper_Mormon cricket\FY 19 Data\Survey\Mapfiles\2019GHMCEndofYear.mxd Coordinate System: NAD 1983 StatePlane Wyoming East Central FIPS 4902 Feet

# Appendix 8: Completed FONSI

**FINDING OF NO SIGNIFICANT IMPACT**
Rangeland Grasshopper and Mormon Cricket Suppression Program
Environmental Assessment in Wyoming
EA Number WY-21-01

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) has prepared an environmental assessment (EA) that analyzes alternatives for suppressing grasshopper and Mormon cricket, hereafter referred to as grasshoppers, outbreaks on rangeland in Wyoming. The EA, incorporated by reference in this document, is available from USDA APHIS PPQ, 5353 Yellowstone Road, Suite 208, Cheyenne, WY 82009 and online at: https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/ea/grasshopper-cricket-ea/grasshopper-cricket-by-state.

The EA includes an analysis of the potential impacts of 3 alternatives. They include (1) No Suppression Program, (2) Insecticide Applications at Conventional Rates or Reduced Agent and Area Treatments (RAATs) with Adaptive Management Strategy, and (3) Research methods. The preferred method will be Reduced Agent and Area Treatments. APHIS participation in this suppression program may be necessary to reduce grasshopper populations in order to preserve rangeland forage levels used for grazing, protect adjacent cropland from being infested with damaging grasshopper species, and to protect range conditions for long term range management. The goal of these suppression treatments is not to eradicate grasshopper species, but to mitigate outbreak populations back to normal levels without causing any significant adverse effects to human health or the environment.

APHIS has determined that the proposed suppression program, conducted in accordance with the APHIS Rangeland Grasshopper/Mormon Cricket Suppression Program Aerial Application Statement of Work and Treatment Guidelines, which contains the operational procedures, will not significantly impact the quality of the human environment.

The finding of no significant impacts was determined on the following:

1. Human health: The 2019 EIS contains detailed hazard, exposure, and risk analyses for the chemicals available to APHIS. Impacts to workers and the general public were analyzed for all possible routes of exposure (dermal, oral, inhalation) under a range of conditions designed to overestimate risk. No treatment will occur over congested areas, recreational areas, or schools and if appropriate, a buffer zone will be enacted and enforced. No treatment will occur directly over water bodies. Furthermore, the following buffers will also be adhered to: 500 foot buffer for aerial liquid insecticides; 200 foot buffer with aerial bait; and a 50 foot buffer for all ground applications. No impact to groundwater is anticipated. Workers will utilize necessary safety protection measures to mitigate the risk of exposure. All APHIS treatments will strictly adhere to label requirements and further protection measures as outlined in the Treatment Guidelines and Operational Procedures. No human health effects are likely.

2. Non-targets: Chemical label instructions and APHIS Treatment Guidelines and Operational Procedures will be strictly followed. This will mitigate any adverse effects on non-targets. Bee keepers will be given notice of any potential treatments in areas that contain domestic or

leaf cutter bees. In all cases when using malathion or carbaryl a two mile buffer for domestic bees and a four mile buffer for leaf cutter bees will be enforced either by the movement of bees or with buffer zones. APHIS will conduct environmental monitoring in areas where buffers are implemented.

3. Endangered and threatened species: Protection measures that resulted from the completed Endangered Species Act Section 7 consultation will be implemented and strictly followed. APHIS will confer with land managers, the U.S. Fish & Wildlife Service and/or Wyoming Game & Fish personnel once treatment areas are identified to determine if any threatened or endangered species occur and, if so, which mitigating measures are needed for the selected treatment option. Suppression treatments are not likely to adversely affect endangered or threatened species or their habitats.

4. Socioeconomic issues: Potential suppression efforts would likely have beneficial economic impacts to local landowners and permittees. The forage not utilized by grasshoppers and Mormon crickets will allow for greater wildlife and livestock grazing, decreased needs for supplemental feed and increased monetary returns.

5. Cultural resources and events: USDA APHIS does not anticipate any impact on cultural resources or events. APHIS will confer with BLM on a local level to protect known cultural, pictograph, and petroglyph sites. Where tribal lands are involved, APHIS will confer locally with Tribal Officials and Bureau of Indian Affairs on possible cultural impacts of proposed suppression efforts.

6. Executive Orders 12898 (low income and minorities), 13045 (children), and 13186 (migratory birds): No adverse effects are anticipated on low income and/or minority populations or children because suppression treatments will be conducted primarily on open rangeland where human activity is unlikely. APHIS routinely conducts programs in a manner that minimizes the impact to the environment, including any impact to migratory birds.

The time between the receipt of a request for treatment and the start of a suppression program is very short. APHIS made the draft EA available for public comment from March 3rd until April 3rd 2021 in order to allow the public to provide input on the proposed program.

Based on the analysis of potential environmental impacts contained in the EA, the implementation of the treatment guidelines (containing the operational procedures) the protection measures for endangered and threatened species, and the comments received I have determined that the proposed suppression program will not significantly impact the quality of the human environment.

BRUCE SHAMBAUGH

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Date: 2021.05.03 10:24:25 -06'00'

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Bruce Shambaugh Date 5/3/21
State Plant Health Director